STOCK COMPOSITIONS OF SOCKEYE SALMON CATCHES IN SOUTHEAST ALASKA'S DISTRICT 111 AND THE TAKU RIVER, 1989, ESTIMATED WITH SCALE PATTERN ANALYSIS

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ABSTRACT

A total of 62,805 sockeye salmon was harvested in the District 111 gill net fishery. The Kuthai, Trapper/Mainstem, Tatsamenie, Crescent, and Speel stock groups contributed an estimated 5,696, 45,573, 11,536, 3,789, and 7,425 fish, respectively. Port Snettisham stocks comprised 15.1% of the catch and Taku River fish comprised the remaining 84.9% of the catch. The Canadian inriver commercial fishery harvested 990 Kuthai, 13,792 Trapper/Mainstem, and 3,763 Tatsamenie sockeye for a total harvest of 18,545. The estimated total Port Snettisham run was 24,637, and the estimated above-border Taku River run was 177,622. Port Snettisham escapements totalled 13,338 sockeye salmon, and the escapement to Canadian portions of the Taku River drainage was estimated at 95,263. The U.S. harvested 59.6% to 65.1% of the total allowable catch (TAC) of above-border Taku river sockeye salmon, and Canada harvested 17.4% to 19.1% of the TAC.

Key Words: sockeye salmon, stock identification, scale pattern analysis, Taku River, District 111.

INTRODUCTION

The Taku River is a transboundary river which originates in central British Columbia and flows southwest through the Coastal Range mountains and Southeast Alaska to the Pacific Ocean (Figure 1). The Taku River supports numerous stocks of salmon that are harvested in U.S. and Canadian fisheries. The U.S. gill net fishery in District 111 targets Taku and Port Snettisham sockeye salmon (*Oncorhynchus nerka*) stocks, and the Canadian fishery in the river targets Taku River sockeye stocks. The U.S./Canada Pacific Salmon Treaty of 1985 established conservation and harvest sharing objectives for the Taku River sockeye run. Cooperative international management of transboundary river sockeye salmon is mandated by this treaty. Provisions specified by the Treaty for the Taku River in 1985 and 1986 were to achieve an interim spawning escapement goal of 71,000 to 80,000 sockeye salmon into Canadian portions of the Taku River. Harvest sharing arangements were to and allow the U.S. an 85% share and Canada a 15% share of the additional sockeye salmon of above-border Taku River origin available for harvest (the total allowable catch, or TAC). Negotiations between the two governments to develop harvest sharing agreements for the 1987 fishing season were unsuccessful and fishing proceeded without such an agreement. In 1988 the two nations agreed to a 5-year harvest sharing plan that allowed the U.S. 82% and Canada 18% of the TAC. The agreement was contingent upon initiation of cooperative international sockeye salmon enhancement projects on the transboundary Taku and Stikine Rivers. Knowledge of stock-specific harvest is needed to fulfill requirements of, and assess compliance with, the harvest sharing guidelines outlined in the Treaty.

Objectives

The purpose of this study is to determine the contributions of major sockeye stock groups to the U.S. gill net fishery in District 111 and the Canadian gill net fishery in the Taku River. The estimation of harvest of Taku sockeye stocks is requisite to implement Treaty guidelines. This report documents the methodology used and results obtained from the 1989 scale pattern analysis (SPA) studies of Taku River and Port Snettisham sockeye salmon. We provide basic statistics for use in assessing the Treaty performance of the U.S. and Canadian fisheries targeting on Taku River sockeye salmon. Scale patterns from fish in both the U.S. and Canadian commercial catches are analyzed both on an in-season and a postseason basis to estimated stock contributions on a weekly basis.

Fisheries

The U.S. allotment of Taku River sockeye salmon is taken primarily in the District 111 gill net fishery in the Taku Inlet-Stephens Passage-Port Snettisham area (Figure 2), although unknown, but assumed small, numbers are taken in other Southeast Alaska fishing districts (McGregor 1985). Sockeye salmon bound for spawning sites in Port Snettisham (Crescent and Speel Lakes, Southeast Alaska) are also harvested in the District 111 fishery. Annual catches in District 111 have averaged 76,248 sockeye salmon (1979 to 1988), and have ranged from 31,627 to 123,117 fish. The majority of the District 111 harvest is generally taken in Taku Inlet. Port Snettisham has been closed to commercial fishing during much of the season in recent years to reduce the catch of Snettisham stocks and begin rebuilding these runs.

The Canadian allotment of Taku River sockeye salmon is taken in a gill net fishery that occurs in the Taku River within 20km upstream of the border between Alaska and the British Columbia, Canada (Figure 1). Annual catches have averaged 14,910 sockeye salmon since the fishery began in 1979, and have ranged from 3,144 to 27,242 fish.

Stock Identification and Escapement Estimation

SPA has been used since 1983 to estimate the contributions of Taku River and Port Snettisham sockeye salmon to the District 111 fishery on a postseason basis. Originally, two composite stock groups were identified in the catches; the Taku group which was represented by scales collected from fish wheel catches in the Taku River and the Snettisham group which was developed from samples collected from the Crescent and Speel Lake weirs (McGregor 1985, 1986). The scale patterns of Taku River, fish changed through the migration and it became apparent that early migrating stocks had different patterns than late migrating stocks. To better reflect this temporal variation in scale patterns, scales used to represent the Taku River run were taken from fish wheel catches in 1985 and were grouped into five sequential time periods. A temporal series of five linear discriminant functions was developed using these grouped samples and samples from the Port Snettisham systems. The weekly catch in District 111 was classified with the appropriate function with an assumed one week lag between the district and Canyon Island (Oliver and McGregor 1986). In 1986, models were further refined by using separate standards for three lake systems (Kuthai, Little Trapper, and Little Tatsamenie) and one composite group for mainstem, tributary, and small lake spawners (Mainstem). The Crescent and Speel stocks from Port Snettisham were also separated and the District 111 model was run with six stock groups (McGregor and Walls 1987; McGregor and Jones 1989a, 1989b). Since 1986, in-season SPA based on data from prior years' scale collections has been used to estimate stock compositions of District 111 catches. In addition, inriver samples from the Canadian fishery and the Canyon Island fish wheel catches have been classified to stock group of origin since 1986.

Stock assessment programs have recently been developed to provide in-season and postseason estimates of the sockeye salmon escapements to the Taku River. An adult mark-recapture program has been jointly operated on the Taku River at Canyon Island by the Alaska Department of Fish and Game (ADF&G) and the Canadian Department of Fisheries and Oceans (CDFO) since 1984 to provide in-season escapement estimates (McGregor and Clark 1987, 1988, 1989, 1990).

METHODS

Numbers of Fish

We obtained catch statistics for District 111 from ADF&G records of fishery sales receipts (fish tickets). These records were taken from the data base on September 5, 1990. Harvest statistics for the Canadian inriver fishery were taken from the Transboundary Technical Committee Report (TTC 1989) and CDFO (Pat Milligan, CDFO, Whitehorse, Yukon Territory, personal communication). Catches were reported by fishing period and were assigned to a statistical week. Each statistical week began at 12:01 p.m. Sunday and ended the following Saturday at midnight. Weeks were sequentially numbered beginning with the first Sunday of the calendar year.

The escapement to Port Snettisham was enumerated at counting weirs located at the outlets of Crescent and Speel Lakes. Tagging and recapture methods were used to estimate the sockeye salmon run size to the Taku River upstream of the U.S./Canada border (McGregor and Clark 1990). Weirs were operated by the CDFO at Little Trapper and Little Tatsamenie Lakes to count escapements of these specific spawning stocks in the Taku River drainage.

Collection and Preparation of Scale Samples

Scales were taken from the left side of the fish approximately two rows above the lateral line along a diagonal downward from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin (INPFC 1963). Scales on salmon fry first develop in this area, and thus, for purposes of aging and digitizing, it is the preferred area. Scales were mounted on gum cards and impressions made in cellulose acetate (Clutter and Whitesel 1956).

Employees of the ADF&G, Commercial Fisheries Division, sampled District 111 catches aboard tenders, fishing vessels, and at the fishing ports of Douglas, Petersburg, and Excursion Inlet. Samplers recorded the sex of each fish sampled and collected one scale. The Canadian inriver harvest was sampled by CDFO and ADF&G employees. Samplers recorded the sex of each fish sampled and took five scales, according to CDFO sampling guidelines. Fish captured in the Canyon Island fish wheels were sampled by ADF&G and CDFO employees.

Similar procedures were used to sample escapements; one to three scales per fish were taken from Alaskan systems, while five scales per fish were taken from headwater systems in Canada. Scales were collected at enumeration weirs at Crescent and Speel Lakes in the Port Snettisham drainages, and in the Taku River drainage at Little Trapper and Little Tatsamenie Lakes. Samples were collected periodically throughout the run from fish captured in weir traps at each of the weir sites. Numerous other Taku River spawning sites including Kuthai Lake, Nahlin River, and sloughs, side channels and spawning areas on the mainstem river were sampled on one or several days. Scale samples were also taken in conjunction with the escapement estimation program at Canyon Island. Fish wheels were used at this location to capture fish for tagging and sampling throughout the duration of the run. The abundance and age composition of the Taku River run past Canyon Island were estimated using this data.

Sex was determined by examination of external sexual maturation characteristics, including kype development, belly, vent, and jaw shapes, or, when possible, by examination of gonads. The accuracy of sex determination from external morphometric characteristics alone was not tested.

Age Composition

Fish ages were determined by visually examining images of scale impressions magnified to 70x on a microfiche reader and were recorded in European notation. Criteria used to determine ages were similar to those of Moser (1968). Scales from fish sampled on the spawning grounds occasionally exhibited resorption along the outer edges. In cases where scale resorption made distinguishing marine age difficult, sex-specific length frequency histograms were used to assist in determining the correct marine age.

Sampling goals for determining the age composition of the harvests were designed to enable the proportion of each major (>10%) age group in the catch during each fishing period to be estimated to within five percentage points 90% of the time (Cochran 1977). Sample goals were met for most fishing periods in the District 111 commercial fishery. Low catches and limited availability of fish to sample in the Canadian inriver fishery prevented desired sample sizes from being achieved in each fishing period for this fishery. Because the age composition of catches often changed significantly between fishing periods, samples from several periods were seldom combined, and lower levels of the accuracy and precision of age composition estimates resulted for this fishery. All fish caught in the Canyon Island fish wheels were sampled for scales.

Scale Digitizing

Scale images magnified at 100X were projected onto a digitizing tablet using equipment similar to that described by Ryan and Christie (1976). Scale measurements were made and recorded with an IBM microcomputer-controlled digitizing system using software modified by L. Talley (ADF&G, Commercial Fisheries, Douglas). The sample size used for the scale pattern analysis varied on a weekly basis and was dependent on age composition. Generally, 100 scales from age-1.3 fish and as many scales as possible (up to 100) from age-1.2 and -2.3 fish were analyzed for each fishery and each week (Appendix A.1).

Previous studies have established that an axis approximately perpendicular to the anterior edge of the unsculptured posterior field is best for consistently measuring sockeye scales (Clutter and Whitesel 1956; Narver 1963). This axis is approximately 20° dorsal or ventral from the anterior-posterior axis, and all circuli counts and scale measurements in the lacustrine and first year marine zone were made along it. Marshall et al. (1984) established the separability of major stock groups by measurements in three (or four) zones: 1) the first freshwater (the scale center to the last circulus of the first freshwater annulus), 2) the second freshwater (when present, the first circuli of the second year of freshwater growth to the end of the second freshwater annulus), 3) the plus growth (scale growth after the last freshwater annulus and before the first marine circulus) (Moser 1968), and 4) the first year marine growth (the first marine circulus to the end of the first marine annulus) (Figure 4). A total of 74 variables, including circuli counts, incremental distances, and ratios and/or combinations of the measured variables are calculated for samples with a single freshwater annular zone and 106 variables for samples with two freshwater annular zones (Appendix A.2)

Discriminant Function Analysis

The ability to differentiate salmon stocks based on scale patterns depends upon the degree of difference in the scale characters between stocks (Marshall et al. 1987). Linear discriminant function (LDF) analysis of scale patterns has been used to estimate stock contributions to the District 111 gill net catches since 1983 (McGregor and Jones 1989).

LDF is a multivariate technique that develops classification rules used to assign a sockeye salmon sampled in a mixed stock fishery to a stock of origin. The variables calculated from the circuli counts and incremental distances on scales from fish of known origin provide a set of measurements used to define these rules. A sample of p selected scale variables from a number of fish in a stock or stock group defines a single region in p-space characteristic of that group of fish. The set of all p-dimensional vectors of measurements for the population forms a multivariate distribution. Discriminant analysis derives the decision surfaces that "best" discriminate between or separate the populations. A sockeye salmon harvested in a mixed stock fishery is classified according to which region its p-dimensional vector occupies. The accuracy of classification depends upon the precision with which the regions defining each stock or group are described and the inherent separation between them. The LDF is the linear combination of p observed variables which maximizes the between-group variance relative to the within-group variance (Fisher 1936).

Assuming that: 1) the groups being investigated are discrete and identifiable; 2) the parent distributions of the measured variables are multivariate normal; and 3) the variance-covariance matrices for all groups are equal, LDF provides the best discriminant rule, in the sense of minimizing the expected probability of misclassification. Gilbert (1969) found LDF satisfactory if the variance-covariances matrices were not too different. In addition, large sample sizes appear to make the LDF robust to the assumption of common variance-covariance matrices (Issacson 1954; Anas and Murai 1969). The method also appears to be robust to violations of the normality assumption for some discrete distributions; however, it is not robust for continuous non-Gaussian parent distributions (Lachenbruch et al. 1973; Krzanowski 1977). Unpublished results from ADF&G studies which compare LDF, QDF (quadratic discriminant analysis), NNN (nearest neighbor analysis), and MLE (maximum likelihood estimation) indicate that LDF has a higher classification accuracy than do QDF or NNN and has an accuracy nearly identical to MLE. This indicates that the above assumptions are met or that LDF is robust to violations of them for the variables used in scale pattern analysis of Southeast Alaska mixed stock sockeye catches.

Scale variables to be used in the LDF are selected with a stepwise regression. In this process variables are added until the partial F-statistic of all variables available for entry into the model is less than 4.00 and all variables in the model have F-values greater than 4 (Enslein et al. 1987). An almost unbiased estimate of classification accuracy for each LDF was determined using a leaving-one-out procedure (Lachenbruch 1967). One sample is "left out", the discriminant rule is estimated, and the "left out" sample is classified using the discriminant rule and checked to see if it was classified correctly. This procedure is repeated for all samples. Thus, when an LDF is run using the leaving-one-out procedure, a classification matrix is developed which gives the proportion of correctly identified fish and the proportion of misclassification of each stock to each of the other stocks (Appendix B).

When more than two stock groups are being analyzed, the stepwise procedure does not always result in maximum classification accuracies or the most balanced classification matrix. Frequently, well separated groups are separated even further, while poorly separated groups remain poorly separated (Habbema and Hermans 1977). Scale variables that provided the best discrimination between the groups that most often misclassified as each other were occasionally added to or substituted for other variables used in the LDF to provide either a better balance to the classification matrix or to increase the mean classification accuracy.

The proportional estimates of stock composition in the mixed stock harvests, referred to as initial estimates, were adjusted with a classification matrix correction procedure (Cook and Lord 1978). The fish in the mixed stock sample are classified with the LDF. The vector of proportional estimates for each stock or stock group is multiplied by the inverse transposed classification matrix to give new estimates, referred to as adjusted estimates, for the true proportions of stocks and stock groups in the mixed stock fishery. In cases where the adjusted estimated proportion for a stock group was less than zero, the entire catch sample was reclassified until all adjusted estimated proportions were positive.

The variance and 90% confidence intervals of the adjusted estimates of stock proportions were computed according to Pella and Robertson (1979). The variances are an additive combination of 1) the sampling variation in estimation of the probability of assignment of the known stock group, and 2) the sampling variation in estimation of the assignment composition of the mixed stock group.

Developing Standards

The three major age groups (1.2, 1.3, and 2.3) contributed 80% to 85% of the sockeye catches in District 111, the Canadian inriver commercial fishery, and in the Canyon Island fish wheels in 1989. Standards were developed for each age class for Kuthai Lake, the Trapper Lake/Mainstem conglomerate, Tatsamenie Lake, and Speel Lake. Standards for Crescent Lake were developed only for the age-1.3 and -2.3 fish. Standards were not developed for age classes which contributed only a minor fraction of the escapement for a given stock since insufficient scales were available to build them. Age-specific models, where standards from a specific age class were used to classify catches of fish of the same age class, were used in the analysis to: 1) account for differences in age composition among stocks, 2) remove potential bias due to differences in migratory timing of different age fish, and 3) eliminate the effect of different environmental conditions on the scale patterns of different age fish.

Classification of Catches

Commercial catches were analyzed in-season with standards developed from the previous year's escapements. Stock contributions for the District 111 commercial catches were estimated and summaries provided to managers within 48h of the fishery closures from mid-June through mid-August. Two of the three major age groups (1.2 and 1.3) were analyzed; the third group (2.3) was not digitized in-season due to time constraints. The District 111 catches were reclassified postseasonally with standards built from the 1989 escapements. The age-2.3 fish from the District 111 catches and the age-1.2 and -1.3 fish from the Canadian catches in the Taku River and from the Canyon Island fish wheel catches were classified postseasonally. The number of samples from age-2.3 fish from the Canadian catch and from fish wheel catches were insufficient to use in stock identification analysis.

Stock contributions were estimated for each week to track temporal patterns; however, in some weeks catches were small and samples of the less common age groups were insufficient to classify, unless pooled with the adjacent week's sample. The proportion of each stock in a week's catch sample was expanded to the week's catch by:

$$C_{ijt} = C_t * P_{it} * S_{ijt}$$

where: C_{ijt} = estimated catch of fish of age i in group j in time period t
C_t = total catch in time period t
P_{it} = estimated proportion of fish of age i in the catch in time period t, and

S_{ijt} = proportion of fish of age i and estimated with LDF to be in group j in the catch in time period t.

The stock apportionment of the minor age groups not classified with LDF assumes that the proportion of the minor ages belonging to any given stock in a catch is equal to the proportion of all LDF classified age classes of that stock in the catch:

$$C_{mjt} = C_t * P_{mt} * S_{1jt}$$

where: C_{mjt} = estimated catch of fish of minor age class m of group j in time period t,

P_{mt} = estimated proportion of fish of minor age group m in the catch in time period t, and

S_{1jt} = proportion of fish estimated with LDF (all analyzed ages combined) to be in group j in the catch in time period t.

Age-0. fish are absent or extremely rare in Taku River and Port Snettisham systems except for the mainstem Taku and Tatsamenie spawning groups. Age-0. fish were apportioned to the mainstem and Tatsamenie groups by:

$$P_{0jt} = S_{1jt}/S_{1\cdot t}$$

where: j is restricted to the Tatsamenie and Mainstem stock groups and

P_{0jt} = estimated proportion of catch of age-0. fish of group j in time period t and

The variances (V) of the weekly ($C_{\cdot jt}$) and seasonal ($C_{\cdot j \cdot}$) stock composition estimates were approximated with the delta method (Seber 1982). The variance estimates are functions of: 1) the accuracy of the age-specific models used to classify the unknowns, 2) the sample size of each standard used to develop the age-specific models, 3) the proportions of each stock in the initial and in the adjusted stock composition estimates, 4) the age-specific stock composition sample sizes, 5) the age composition sample sizes, and 6) the catch size. However, it is a minimum estimate of variance since it does not include any variance associated with the age classes not classified with LDF, any variance for stocks contributing no fish during a given week, nor any estimator of aging errors. Variances of proportions of stock contributions were calculated with formulae from Pella and Robertson (1979).

Comparison of In- and Postseason Estimates

Adjusted in-season stock composition estimates were compared to postseason estimates for the District 111 catches. The weekly in-season estimates were derived in a different manner than were the postseason methods. The in-season stock composition estimates were based on LDF analysis of age-1.2 and -1.3 fish, age-2. fish were apportioned based on the stock composition estimates from the age-1. fish and age-0. fish were all apportioned to the Mainstem group. Since the Trapper and Mainstem groups were combined in the postseason analysis, the estimates of Trapper and of Mainstem fish in the in-season analysis were combined to facilitate comparison of the in-season and postseason estimates.

Test for Presence of Lynn Canal Fish

Chilkat and Chilkoot standards were constructed with 100 age-1.3 fish from each stock group. An age-1.3 LDF was built with Chilkoot and Chilkat stocks in addition to the five Taku River/Port Snettisham stock groups. Weekly catches in District 111 were classified with the seven stock function to determine if Lynn Canal fish were present in the district.

RESULTS

Numbers of Fish

A total of 74,019 sockeye salmon was harvested by the commercial drift gill net fleet in District 111 in 1989 (Table 1), roughly equal to the 1979 to 1988 average of 76,248 fish. The fishery was open 38 days. The majority of the catch (92%) was taken in Taku Inlet (Subdistrict 111-32; Figure 2). Approximately 6% of the catch was taken in Stephens Passage (Subdistrict 111-31), half the historical average of 12% (1964 to 1988). Catches in Port Snettisham (111-34) and lower Stephens Passage (111-20) were less than 1% and 2%, respectively, of the harvest. A test fishery in Port Snettisham harvested 85 sockeye salmon (Table 2). The U.S. personal use fishery in the Taku River harvested an estimated 749 sockeye salmon.

The Canadian commercial fishery in the Taku River harvested 18,545 sockeye salmon (Table 2), compared to an average harvest of 14,910 (1979 to 1988). The fishery was open 25.3 days. The Canadian food fishery harvested 53 sockeye salmon and the test fishery catch totaled 207 sockeye salmon.

Age and Sex Composition

Age-1.3 fish were the dominant age class in the District 111 sockeye fishery and comprised 69.8% of the catch (Appendix C.1). Age-1.3 fish comprised between 63% and 81% of the weekly catches except for the end of the season (mid-August to late September), when they contributed only 54.6% of catch. Other major age classes included age-0.3, -1.2, and -2.3 fish which represented 11.6%, 8.1%, and 7.1% of the catch, respectively. Age-0. fish were uncommon prior to mid-season (week 28). During the final weeks of the season the age-2.2 and -2.3 fish comprised 10.7% and 16.6% of the catch, respectively, a much higher contribution rate than either age had contributed earlier in the season. Males comprised 49.5% of the season's catch.

Age-1.3 fish were also the dominant age class in the Canadian commercial catches in the Taku River and contributed 67.8% of the catch, with a weekly range of 49.2% to 80.7% (Appendix C.2). Age-0.3, -1.2, and -2.3 fish comprised 12.5%, 11.6%, and 4.1% of the catch, respectively. No other age class contributed more than 2% of the season's catch. Age-0. fish became relatively more abundant as the season progressed. There was no increase in abundance of the age-2.2 and -2.3 fish in the final weeks of the season as was observed in the District 111 catch. Males comprised 49.4% of the season's catch.

The Canyon Island fish wheel catches had a more diverse age composition and a higher abundance of younger age fish than did the inriver commercial catch (Appendix C.3). The catch was comprised of age-1.3 (58.7%), -1.2 (19.5%), -0.3 (6.5%), -1.1 (4.3%), -2.2 (3.4%), and -2.3 (3.8%). No other age class comprised more than 3% of the catch. Age-1.3 fish were relatively most abundant prior to mid June (> 90%) and declined to 40.5% of the catch by late August. The abundance of age-0. fish increased from less than 1% of the early June catches to a peak of 20.6% of the early August catch. Jack sockeye (age-.1) were rare during the early weeks of the season and increased to 11.8% of the catch in early August. Males comprised 54.2% season catch and were more abundant than females in all weeks except in early August and during the final weeks of the season.

Individual Taku River stocks exhibited a wide diversity in age composition (Appendix C.4). Age-0. fish were absent from Kuthai and Little Trapper Lakes, comprised 17.5% of the Little Tatsamenie Lake samples, and ranged from 6.4% to 65.0% of the mainstem and slough samples. Age-1.3 fish were the most abundant age class in samples from lake systems, although Little Tatsamenie also had a high abundance of age-1.2 fish. Age-1.2 fish were also abundant in mainstem and slough spawners and Yehring Creek samples.

Port Snettisham escapements were dominated by age-1.3 fish. The escapement into Crescent Lake was 80.1% age-1.3, 6.2% age-1.2, and 9.0% age-2.3 fish; the Speel Lake escapement was 62.7% age-1.3 and 27.3% age-1.2, and 7.4% age-2.3 fish. Age-0. fish were rare, less than 1% of the samples, in either system.

Escapement Standards

Kuthai Lake fish exhibited the greatest freshwater growth followed by fish from Little Tatsmenie Lake. Crescent Lake fish had the smallest freshwater growth. Speel Lake, Little Trapper Lake, and the Mainstem Taku conglomerate had intermediate freshwater growth rates. The Little Trapper Lake and Mainstem Taku fish were indistinguishable based on either freshwater or marine growth, therefore, the two groups were combined for the 1989 postseason stock composition analysis.

Standards were built for all stock groups for age-1.3 and -2.3 fish. There was no age-1.2 standard for Crescent Lake fish since this group was a very minor component of the escapement and there were insufficient scales. District 111 catches were initially classified using functions including all stock groups, while Snettisham standards were not included in LDF's used to classify inriver commercial and fish wheel catches.

Mean classification accuracies for age-1.2 models ranged from 98.9% to 64.8% (Appendix B.1). The Kuthai Lake fish had the highest individual classification rates (>90%), followed by Speel Lake fish. Classification rates for Trapper/Mainstem and for Tatsamenie ranged from 50% to 70%. Mean classification accuracies for age-1.3 fish ranged from 68.7% to 99.4% (Appendix B.2). Kuthai Lake again had the greatest individual classification rates (99.4%). The other stock groups had accuracies ranging from 62.3% to >90%. The age-2.3 models had mean classification accuracies ranging from 74.5% to 81.2% (Appendix B.3). Individual stock classification accuracies were variable among models and ranged from 67.9% to 93.3%.

Stock Composition Estimates

The Trapper/Mainstem group contributed the majority (45,573 fish; 61.6%) of the District 111 catch, while the Kuthai, Little Tatsamenie, Crescent, and Speel stock groups contributed 5,696, 11,536, 3,789, and 7,425 fish, respectively, to the catch (Appendix C.5). Port Snettisham stocks comprised 15.1% of the District 111 harvest, and Taku River sockeye salmon comprised the remaining 84.9% of the catch. Kuthai Lake fish contributed 49.3% of the catch during mid-June (week 25), then declined in abundance through the remainder of the season. The Trapper/Mainstem group dominated the catch through late July (week 30), after which the Tatsamenie group was a major catch component. Crescent and Speel fish were most abundant during mid-July through early August (weeks 29 through 31).

The peak catch and CPUE (17,345 fish and 74 fish per boat day) occurred in early July (week 28) (Appendix C.6). The peak CPUE for Kuthai fish occurred during the first week of the season, while that of Trapper/Mainstem and Little Tatsamenie occurred in weeks 28 and 32, respectively. There was no distinct peak in the Crescent CPUE while the Speel CPUE peaked in week 30.

Since 1986 the Taku contribution has averaged 78% of the District 111 catch (Appendix D.1). The highest total catch (74,994) and Port Snettisham catch (21,023) occurred in 1987 (Appendix D.2). The catch of Taku River fish in 1989 was the highest since 1986.

The Trapper/Mainstem stock group contributed 13,792 fish to the Canadian commercial catch in the Taku River (Appendix C.7). The Kuthai and Little Tatsamenie groups contributed 990 and 3,763 fish, respectively. The Trapper/Mainstem group was the most abundant catch component during every week of the season, while Kuthai Lake fish were rare after early July (week 27). Tatsamenie fish were most abundant after early August (week 31).

The peak catch occurred during early July (week 27), while the peak CPUE occurred during early August (week 32, 92 fish per permit day)(Appendix C.8). The peak CPUEs for Kuthai (21), Trapper/Mainstem (65), and Tatsamenie (36) occurred in weeks 26, 30, and 32, respectively.

The Trapper/Mainstem group also dominated the fish wheel catches at Canyon Island with 3,119 fish, while the Kuthai and Little Tatsamenie groups contributed 726 and 427 fish, respectively (Appendix C.10). The Canyon Island catches are raw data, unweighted by effort or water level. Kuthai Lake fish were the most abundant stock in the catches from late May through late June (weeks 22 through 25) (Appendix C.11). The Trapper/Mainstem group comprised more than 75% of the weekly catches through the remainder of the season. More than 10% of the weekly catches in most weeks after late July was comprised of Little Tatsamenie fish.

Total Run Estimates

The mark-recapture estimate of the sockeye salmon run past Canyon Island was 114,068 fish, of which 95,263 escaped to spawn (McGregor and Clark 1990). The total estimated run of Taku River sockeye salmon was 177,622 fish (Table 2). The escapement was above the U.S./Canada goal range of 71,000 to 80,000 fish, thus, the catch of 82,359 fish was below the TAC. With a TAC range of 97,622 to 106,622, the U.S. harvested 59.6% to 65.1% and Canada harvested 17.4% to 19.1% of the TAC. Estimated exploitation rates on the Tatsamenie stock were 62.8% for the U.S. and 20.5% for Canada, and on the entire Taku run were 35.8% (U.S.) and 10.4% (Canada). Exploitation rates in District 111 for the Crescent and Speel stocks were estimated at 77.4% and 37.8%, respectively.

In-season vs Postseason Estimates

There were only small differences between the in- and postseason stock composition estimates (District 111) prior to mid-July. However, after week 28 the Trapper/Mainstem contribution was consistently overestimated in the in-season analysis and the Tatsamenie contribution was underestimated (Appendix E).

Test for Presence of Lynn Canal Fish

LDF analysis indicated that there were no age-1.3 Chilkat or Chilkoot sockeye salmon present in the District 111 catches in 1989.

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Table 1. District 111 fishery openings, effort, and harvest of sockeye salmon by subdistrict, 1989.

Stat. Week	Dates Open	Days Open	Number of Boats	Effort (Boat days)	Catch per Subdistrict 20	31	32	34	Total Catch	CPUE
25[a/b/]	6/18-6/21	3	63	189		398	5,721		6,119	32.38
26[a/b/]	6/25-6/28	3	65	195		887	6,206		7,093	36.37
27[a/b/c/]	7/02-7/05	3	78	234		1,012	9,366		10,378	44.35
28[b/c/d/]	7/09-7/12	3	84	252	47	542	16,756		17,345	68.83
29[b/c/d/]	7/16-7/19	3	79	237	13	763	14,217		14,993	63.26
30[b/c/d/e/]	7/23-7/26	3	71	213	326	358	7,348		8,032	37.71
31[b/c/e/f/]	7/31-8/02	3	46	138	713	314	2,949		3,976	28.81
32[b/g/h/]	8/07-8/10	3	20	60	223		2,295		2,518	41.97
33[b/c/]	8/13-8/16	3	46	138	18	120	1,580		1,718	12.45
34	8/20-8/23	3	68	204		127	1,324	20	1,471	7.21
35	8/27-8/12	3	104	312		11	282	8	301	0.96
36[i/]	9/03-9/05	2	62	124		12	36		48	0.39
37[i/]	9/10-9/11	2	45	90		1	23		24	0.27
38[i/]	9/17-9/18	1	45	45		2	1		3	0.07
Totals		38		2,431	1,340	4,547	68,104	28	74,019	30.45

a/ Taku Inlet closed north of Jaw Point.

b/ Port Snettisham closed east of a line from Point Styleman to Point Anmer.

c/ Waters south of the latitude of Midway Island to a line from Point League to Point Hugh open to fishing.

d/ Stephens Passage closed within 2 miles from mainland shore from Circle Point to Midway Island.

e/ An additional 2 days of fishing were allowed south of the latitude of Midway Island (these days were not included in the effort table).

f/ Stephens Passage open except within 2 miles of the eastern shore from 1 mile North of Point Styleman to 1 mile south of Point Anmer.

g/ Fishery openings in 111 and 115 delayed from 12:01 p.m. sunday to 12:01 p.m. Monday (to reduce fishing vessel conjestion during the Juneau Salmon Derby).

h/ an additional 1 day of fishing was allowed south of the latitude of Midway Island (these days were not included in the effort table).

i/ Taku Inlet was closed north of a line from Cooper Point to Greely Point.

Table 2. Catch and escapement of Port Snettisham and Taku River sockeye salmon stocks, 1989.

Port Snettisham Stocks

Area	Crescent	Speel	Total
U.S. District 111 Commercial Catch	3,789	7,425	11,214
Test Fishery[a]			85
Spawning Escapement	1,109[b]	12,229	13,338
Total Run	4,898	19,654	24,637
Exploitation Rate	0.774	0.378	0.455

Taku River Stocks

Area	Kuthai	Tr/Main	Tatsamenie	Total
U.S. Catch				
District 111	5,696	45,573	11,536	62,805
Inriver personal use				749
Total U.S. Catch	5,696	45,573	11,536	63,554
Canadian Catch				
Commercial	990	13,792	3,763	18,545
Food				53
Total Canadian Catch	990	13,792	3,763	18,598
Canadian Test Fishery	23	142	42	207
Total Catch	6,709	59,507	15,341	82,359
Spawning Escapement			3,039	95,263
Total Above Border Run[c]				114,068
Total Run			18,380	177,622
Exploitation Rates				
U.S. Commercial			0.628	0.358
Canadian Commercial			0.205	0.105

[a] The U.S. test fishery was operated in Port Snettisham.
[b] The escapement may have been higher due to uncounted fish passage over the weir during high water.
[c] The above border run includes above border catches and escapements.

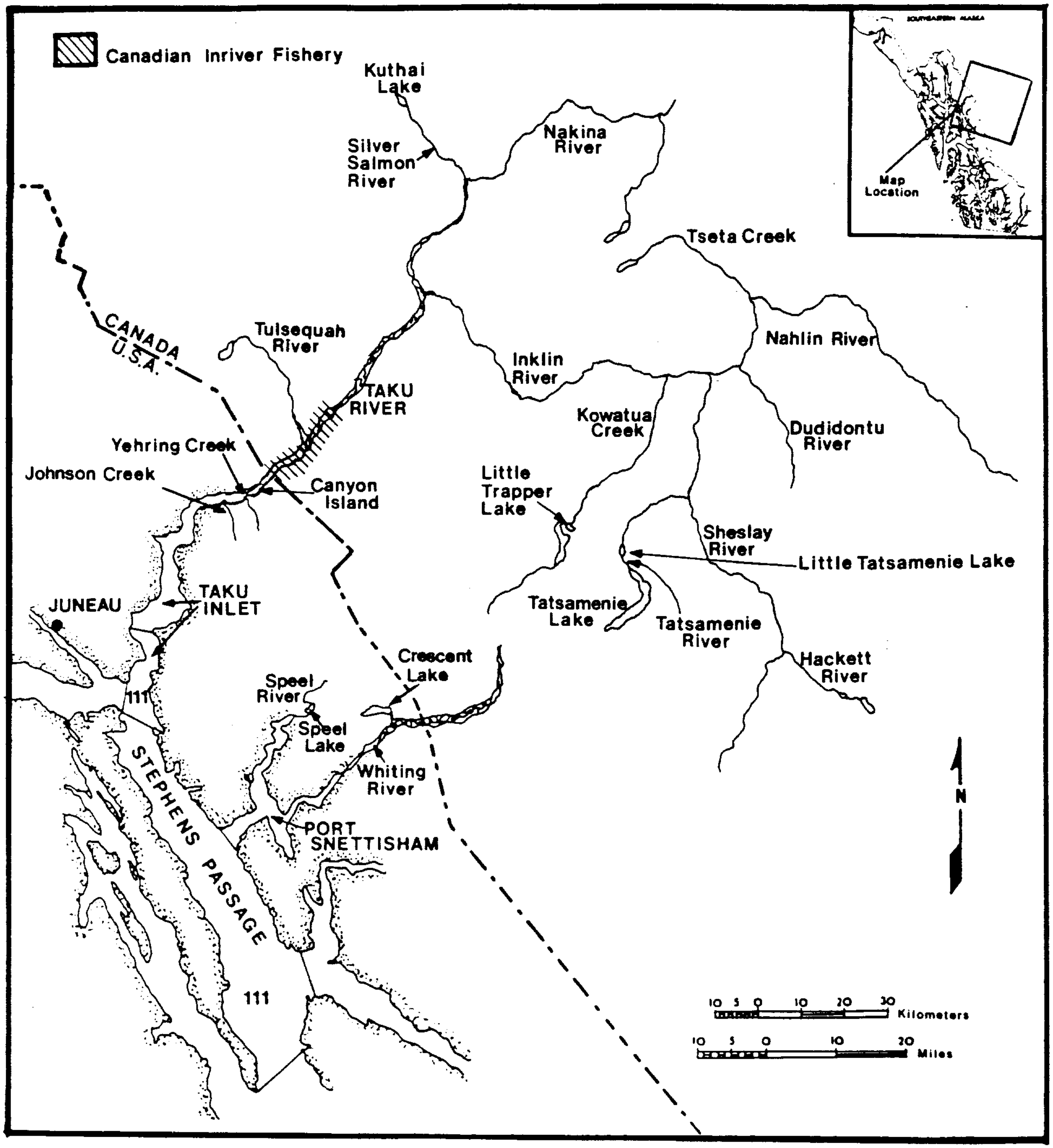

Figure 1. Taku River and Port Snettisham drainages.

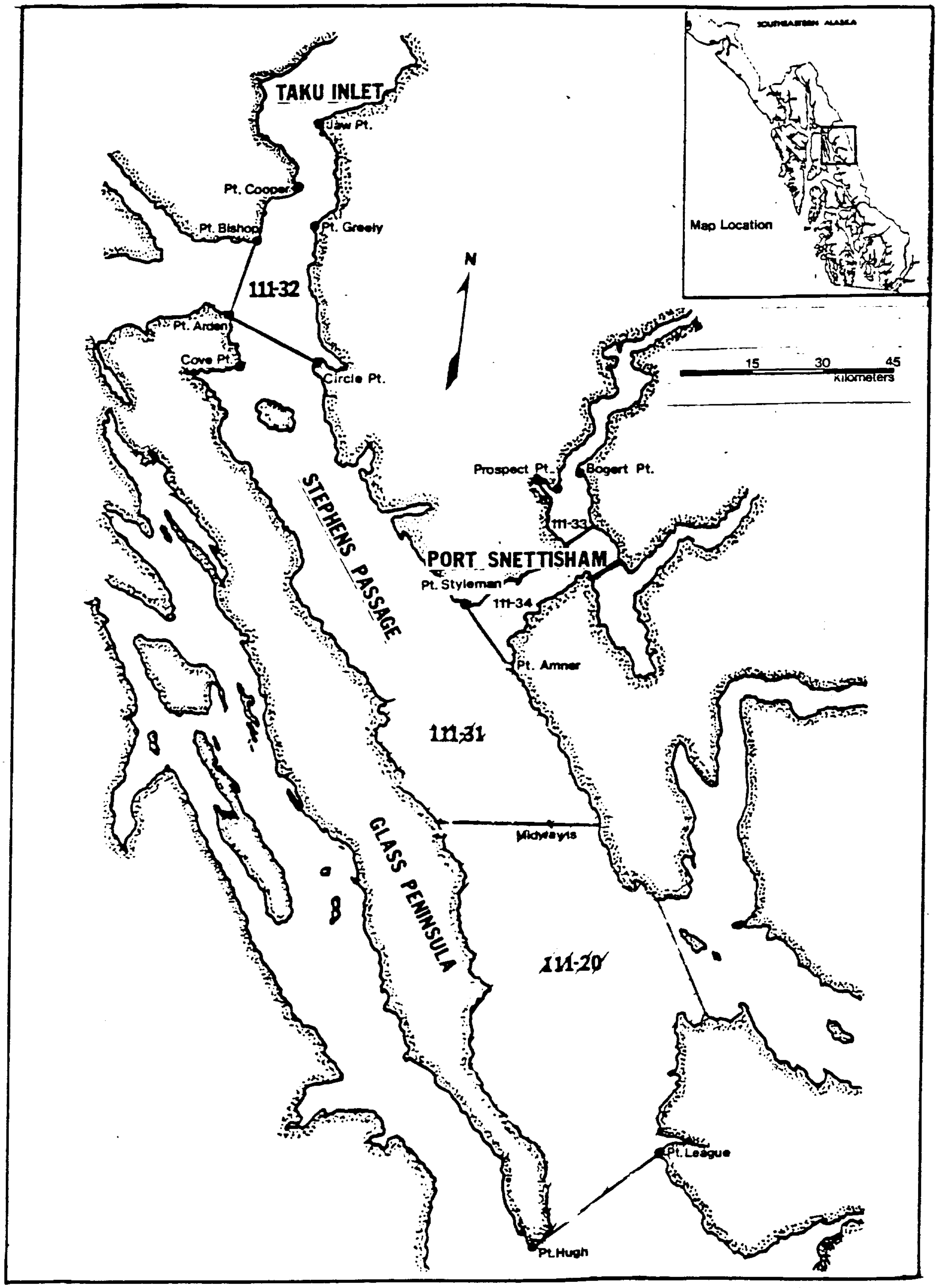

Figure 2. District 111 fishing area.

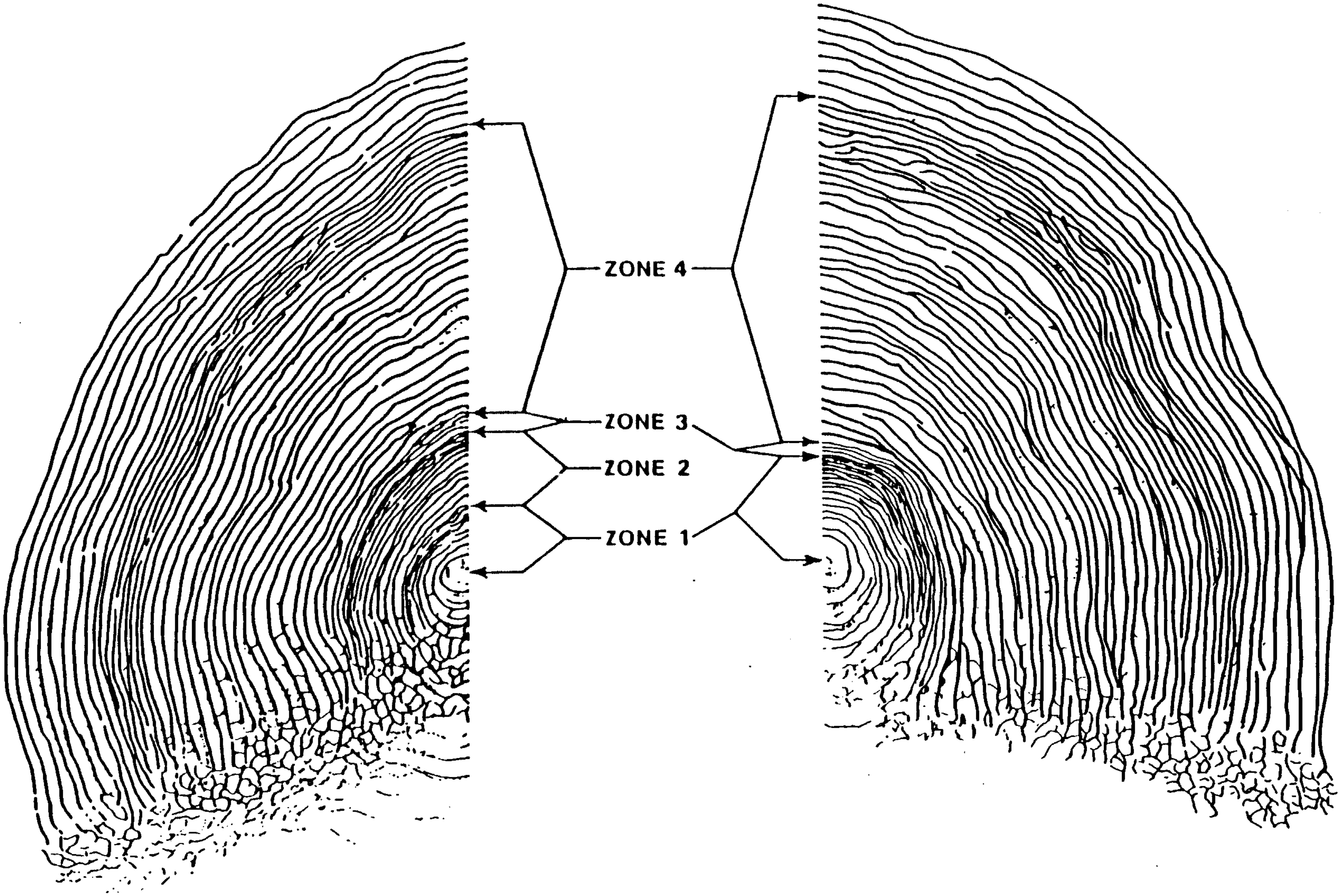

Figure 3. Typical scale for age -2. (left) and -1. (right) sockeye salmon with zones used for scale pattern analysis delineated.

APPENDICES

Appendix A.1. Sample sizes from the in-season and postseason sockeye salmon stock composition analysis of catches in District 111, the Taku River, and in the Canyon Island fish wheels, 1989.

Stat. Week	Date	Sample Size by Age Group 1.2	1.3	2.3	Total
In-Season Analysis					
U.S. District 111					
25	6/18-6/24	52	100		152
26	6/25-7/01	45	100		145
27	7/02-7/08	33	100		133
28	7/09-7/15	33	100		133
29	7/16-7/22	43	100		143
30	7/23-7/29	63	99		162
31	7/30-8/05	48	100		148
32	8/06-8/12	37	99		136
33	8/13-8/19	30	99		129
Postseason Analysis					
U.S. District 111					
25	6/18-6/24	52	100	41	193
26	6/25-7/01	45	100	39	184
27	7/02-7/08	33	100	49	182
28	7/09-7/15	33	100	34	167
29	7/16-7/22	43	100	35	178
30	7/23-7/29	63	99	30	192
31	7/30-8/05	48	100	23	171
32	8/06-8/12	37	99	7	143
33	8/13-8/19	30	100	64	194
Canadian Inriver					
26	6/25-7/01	23	100		123
27	7/02-7/08	13	100		113
28	7/09-7/15	9	93		102
29	7/16-7/22	18	100		118
30	7/23-7/29	30	84		114
31	7/30-8/05	16	78		94
32	8/06-8/12	13	100		113
33	8/13-8/19	9	43		52
34	8/20-8/26	12	41		53
Canyon Island Fish Wheel					
23	6/04-6/10		100		100
24	6/11-6/17		100		100
25	6/18-6/24	60	100		160
26	6/25-7/01	100	100		200
27	7/02-7/08	80	100		180
28	7/09-7/15	98	100		198
29	7/16-7/22	96	100		196
30	7/23-7/29	75	100		175
31	7/30-8/05	92	100		192
32	8/06-8/12	82	100		182
33	8/13-8/19	80	66		146
34	8/20-8/26		57		57

Appendix A.2. Scale variables used for age-1.2, -1.3, -2.2, and -2.3 sockeye salmon scale pattern analysis.

Variable Number	Description
	First Freshwater (FW) Annular Zone
1	Number of circuli in the zone
2	Distance across the zone
3	Distance: scale focus (CO) to the second circulus in zone (C2)
4	Distance: C0 to C4
5	Distance: C0 to C6
6	Distance: C0 to C8
7	Distance: C2 to C4
8	Distance: C2 to C6
9	Distance: C2 to C8
10	Distance: C4 to C6
11	Distance: C4 to C8
12	Distance: fourth from the last circulus of zone to end of zone
13	Distance: second from the last circulus of zone to end of zone
14	Distance: C2 to end of zone
15	Distance: C4 to end of zone
16	Relative Distance: (Variable #3)/(Variable #2)
17	Relative Distance: (Variable #4)/(Variable #2)
18	Relative Distance: (Variable #5)/(Variable #2)
19	Relative Distance: (Variable #6)/(Variable #2)
20	Relative Distance: (Variable #7)/(Variable #2)
21	Relative Distance: (Variable #8)/(Variable #2)
22	Relative Distance: (Variable #9)/(Variable #2)
23	Relative Distance: (Variable #10)/(Variable #2)
24	Relative Distance: (Variable #11)/(Variable #2)
25	Relative Distance: (Variable #12)/(Variable #2)
26	Relative Distance: (Variable #13)/(Variable #2)
27	Average Distance between circuli: (Variable #2)/(Variable #1)
28	Number of circuli in the first 3/4 of the zone
29	Maximum distance between two adjacent circuli in the zone
30	Relative Distance: (Variable #29)/(Variable #2)
	Second Freshwater (FW) Annular Zone
31	Number of circuli in the zone
32	Distance across the zone
33	Distance: end first annular zone (E1FW) to second circulus in zone
34	Distance: E1FW to C4
35	Distance: E1FW to C6
36	Distance: E1FW to C8
37	Distance: C2 to C4
38	Distance: C2 to C6
39	Distance: C2 to C8

-Continued-

Appendix A.2. (p 2 of 3)

Variable Number	Description
40	Distance: C4 to C6
41	Distance: C4 to C8
42	Distance: fourth from the last circulus of zone to end of zone
43	Distance: second from the last circulus of zone to end of zone
44	Distance: C2 to end of zone
45	Distance: C4 to end of zone
46	Relative Distance: Variable #33/Variable #32
47	Relative Distance: Variable #34/Variable #32
48	Relative Distance: Variable #35/Variable #32
49	Relative Distance: Variable #36/Variable #32
50	Relative Distance: Variable #37/Variable #32
51	Relative Distance: Variable #38/Variable #32
52	Relative Distance: Variable #39/Variable #32
53	Relative Distance: Variable #40/Variable #32
54	Relative Distance: Variable #41/Variable #32
55	Relative Distance: Variable #42/Variable #32
56	Relative Distance: Variable #43/Variable #32
57	Average Distance between circuli: Variable 32/Variable 31
58	Number of circuli in first 3/4 of zone
59	Maximum distance between two adjacent circuli in the zone
60	Relative Distance: Variable 59/Variable 32
	Freshwater Plus Growth (PG)
61	Number of circuli in the zone
62	Distance across the zone
	Combined Freshwater Zones
63	Total number annular circuli, Variable 1 + Variable 31
64	Total distance across freshwater zones, Variable 2 + Variable 32
65	Total number of circuli in the combined zones, NC1FW+NC2FW+NCPG
66	Total distance across the combined zones, S1FW+S2FW+SPGZ
67	Relative Distance: (Variable #2)/(Variable #66)
	First Marine (C) Annular Zone
70	Number of circuli in the zone
71	Distance across the zone
72	Distance: end of FW (EFW) to the third circulus in zone (C3)
73	Distance: EFW to C6
74	Distance: EFW to C9
75	Distance: EFW to C12
76	Distance: EFW to C15

-Continued-

Appendix A.2. (p 3 of 3)

Variable Number	Description
77	Distance: C3 to C6
78	Distance: C3 to C9
79	Distance: C3 to C12
80	Distance: C3 to C15
81	Distance: C6 to C9
82	Distance: C6 to C12
83	Distance: C6 to C15
84	Distance: C9 to C15
85	Distance: sixth from the last circulus of zone to end of zone
86	Distance: third from the last circulus of zone to end of zone
87	Distance: C3 to end of zone
88	Distance: C9 to end of zone
89	Distance: C15 to end of zone
90	Relative Distance: (Variable #72)/(Variable #71)
91	Relative Distance: (Variable #73)/(Variable #71)
92	Relative Distance: (Variable #74)/(Variable #71)
93	Relative Distance: (Variable #75)/(Variable #71)
94	Relative Distance: (Variable #76)/(Variable #71)
95	Relative Distance: (Variable #77)/(Variable #71)
96	Relative Distance: (Variable #78)/(Variable #71)
97	Relative Distance: (Variable #79)/(Variable #71)
98	Relative Distance: (Variable #80)/(Variable #71)
99	Relative Distance: (Variable #81)/(Variable #71)
100	Relative Distance: (Variable #82)/(Variable #71)
101	Relative Distance: (Variable #83)/(Variable #71)
102	Relative Distance: (Variable #84)/(Variable #71)
103	Relative Distance: (Variable #85)/(Variable #71)
104	Relative Distance: (Variable #86)/(Variable #71)
105	Relative Distance: (Variable #87)/(Variable #71)
106	Number of circuli in the first 1/2 of the zone
107	Maximum distance between two adjacent circuli in the zone
108	Relative Distance: (Variable #107)/(Variable #71)

Appendix B.1. Classification matrices from discriminant function models used to classify age-1.2 sockeye salmon from District 111, Canadian inriver, and Canyon Island fish wheel catches, 1989. * Indicates models used in final run, other models, if present, were used only for intermediate steps.

Actual Group of Origin	Sample Size	Kuthai	Trapper/ Mainstem	Tatsamenie	Speel
		Classified Group of Origin			
4 Stock Model					
Kuthai	157	0.901	0.000	0.019	0.000
Trap/Main	132	0.008	0.530	0.242	0.220
Tatsamenie	149	0.007	0.362	0.664	0.027
Speel	200	0.000	0.135	0.045	0.820
		* Mean Prop. Correctly Class.			0.734
3 Stock Model					
Kuthai	157	0.987	0.000	0.013	
Trap/Main	132	0.008	0.705	0.288	
Tatsamenie	149	0.013	0.342	0.644	
		* Mean Prop. Correctly Class.			0.779
3 Stock Model					
Trap/Main	132		0.553	0.242	0.205
Tatsamenie	149		0.356	0.661	0.034
Speel	200		0.170	0.050	0.780
		* Mean Prop. Correctly Class.			0.648
2 Stock Model					
Kuthai	157	0.994	0.006		
Trap/Main	132	0.015	0.985		
		* Mean Prop. Correctly Class.			0.989
2 Stock Model					
Trap/Main	132		0.735	0.265	
Tatsamenie	149		0.295	0.705	
		* Mean Prop. Correctly Class.			0.720

Appendix B.2. Classification matrices from discriminant function models used to classify age-1.3 sockeye salmon from District 111, Canadian inriver, and Canyon Island fish wheel catches, 1989. * Indicates final models, others were used only for intermediate steps.

Actual Group of Origin	Sample Size	Classified Group of Origin				
		Kuthai	Trapper/ Mainstem	Tatsamenie	Crescent	Speel
5 Stock Model:						
Kuthai	155	0.994	0.000	0.006	0.000	0.000
Trap/Main	361	0.003	0.654	0.105	0.053	0.186
Tatsamenie	154	0.006	0.305	0.617	0.026	0.045
Crescent	197	0.000	0.162	0.020	0.660	0.157
Speel	200	0.000	0.160	0.040	0.035	0.765
	*	Mean Proportion Correctly Classified				0.738
4 Stock Model:						
Kuthai	155	0.994	0.000	0.000		0.006
Trap/Main	361	0.000	0.623	0.222		0.155
Tatsamenie	154	0.000	0.253	0.071		0.675
Speel	200	0.000	0.140	0.815		0.045
		Mean Proportion Correctly Classified				0.777
4 Stock Model:						
Kuthai	155	0.994	0.000		0.000	0.006
Trap/Main	361	0.006	0.740		0.058	0.197
Crescent	197	0.000	0.147		0.706	0.147
Speel	200	0.000	0.200		0.025	0.775
	*	Mean Proportion Correctly Classified				0.803
4 Stock Model:						
Kuthai	155	0.994	0.000	0.006	0.000	
Trap/Main	361	0.003	0.770	0.108	0.119	
Tatsamenie	154	0.006	0.312	0.656	0.026	
Crescent	197	0.000	0.269	0.020	0.711	
		Mean Proportion Correctly Classified				0.783
4 Stock Model:						
Trap/Main	361		0.695	0.094	0.064	0.147
Tatsamenie	154		0.338	0.623	0.026	0.013
Crescent	197		0.173	0.020	0.690	0.117
Speel	200		0.185	0.040	0.035	0.740
	*	Mean Proportion Correctly Classified				0.687
3 Stock Model:						
Kuthai	155	0.994	0.000	0.006		
Trap/Main	361	0.003	0.867	0.130		
Tatsamenie	154	0.006	0.338	0.656		
	*	Mean Proportion Correctly Classified				0.839
2 Stock Model:						
Kuthai	155	0.994	0.006			
Trap/Main	361	0.006	0.994			
	*	Mean Proportion Correctly Classified				0.994
2 Stock Model:						
Trap/Main	361		0.864	0.136		
Tatsamenie	154		0.273	0.727		
	*	Mean Proportion Correctly Classified				0.796

Appendix B.3. classification matrices from discriminant function models used to classify age-2.3 sockeye salmon from District 111, Canadian inriver, and Canyon Island fish wheel catches, 1989. * Indicates models used in final run, other models, if present, were used only for intermediate steps.

Actual Group of Origin	Sample Size	Classified Group of Origin: Kuthai	Trapper/ Mainstem	Tatsamenie	Crescent	Speel
5 Stock Model						
Kuthai	44	0.864	0.114	0.023	0.000	0.000
Trap/Main	66	0.061	0.712	0.121	0.076	0.030
Tatsamenie	28	0.107	0.179	0.714	0.000	0.000
Crescent	69	0.014	0.116	0.014	0.710	0.145
Speel	69	0.000	0.043	0.000	0.232	0.725
		* Mean Proportion Correctly Classified				0.745
4 Stock Model						
Kuthai	44	0.773	0.136	0.091		0.000
Trap/Main	66	0.091	0.803	0.045		0.061
Tatsamenie	28	0.179	0.143	0.679		0.000
Speel	69	0.000	0.043	0.000		0.957
		* Mean Proportion Correctly Classified				0.803
4 Stock Model						
Kuthai	44	0.932		0.068	0.000	0.000
Tatsamenie	28	0.179		0.821	0.000	0.000
Crescent	69	0.014		0.043	0.754	0.188
Speel	69	0.014		0.014	0.232	0.739
		* Mean Proportion Correctly Classified				0.812

Appendix C.1. Age and sex composition of the District 111 gill net harvest of sockeye salmon, 1989.

			Brood Year and Age Class									
			1986	1985			1984			1983		
Stat. Week	Percent Males		0.2	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	Total
6/18-6/24	49.2	Sample	0	14	53	0	1	483	7	1	43	602
Week 25		Percent		2.3	8.8		0.2	80.2	1.2	0.2	7.1	
		S.E.		0.6	1.1		0.2	1.5	0.4	0.2	1	
		Catch		142	539		10	4,910	71	10	437	6,119
6/25-7/01	49.8	Sample	0	29	48	0	0	449	4	3	43	576
Week 26		Percent		5.0	8.3			78	0.7	0.5	7.5	
		S.E.		0.9	1.1			1.7	0.3	0.3	1.1	
		Catch		357	590			5,529	50	37	530	7,093
7/02-7/08	50.1	Sample	5	42	33	0	0	434	7	0	52	573
Week 27		Percent	0.9	7.3	5.8			75.7	1.2		9.1	
		S.E.	0.4	1.1	0.9			1.7	0.4		1.2	
		Catch	90	761	598			7,860	127		942	10,378
7/09-7/15	53.3	Sample	4	63	35	0	0	347	4	3	34	490
Week 28		Percent	0.8	12.9	7.1			70.8	0.8	0.6	6.9	
		S.E.	0.4	1.5	1.1			2.0	0.4	0.3	1.1	
		Catch	142	2,230	1,239			12,282	142	106	1,204	17,345
7/16-7/22	48.0	Sample	12	110	45	0	0	369	14	0	37	587
Week 29		Percent	2.0	18.7	7.7			62.9	2.4		6.3	
		S.E.	0.6	1.6	1.1			2.0	0.6		1.0	
		Catch	307	2,810	1,149			9,425	357		945	14,933
7/23-7/29	48.1	Sample	8	96	64	1	1	401	9	2	27	609
Week 30		Percent	1.3	15.8	10.5	0.2	0.2	65.8	1.5	0.3	4.4	
		S.E.	0.4	1.4	1.2	0.2	0.2	1.8	0.5	0.2	0.8	
		Catch	106	1,266	844	13	13	5,289	119	26	356	8,032
7/30-8/05	50.6	Sample	6	76	49	0	0	358	23	1	24	537
Week 31		Percent	1.1	14.2	9.1			66.7	4.3	0.2	4.5	
		S.E.	0.4	1.4	1.2			1.9	0.8	0.2	0.8	
		Catch	44	563	363			2,651	170	7	178	3,976
8/06-8/12	45.2	Sample	3	49	39	0	0	280	18	0	7	396
Week 32		Percent	0.8	12.4	9.8			70.7	4.5		1.8	
		S.E.	0.4	1.5	1.4			2.1	1.0		0.6	
		Catch	19	312	248			1,780	114		45	2,518
8/13-9/23	41.2	Sample	3	20	48	0	0	214	42	0	65	392
Wk. 33-38		Percent	0.8	5.1	12.2			54.6	10.7		16.6	
		S.E.	0.4	1	1.6			2.4	1.5		1.8	
		Catch	27	182	437			1,946	382		591	3,565
	49.5	Sample	41	499	414	1	2	3,335	128	10	332	4,762
Season		Percent	1.0	11.6	8.1	0.1	0.1	69.8	2.1	0.3	7.1	
Totals		S.E.	0.2	0.5	0.4	0.1	0.1	0.7	0.2	0.1	0.4	
		Catch	735	8,623	6,007	13	23	51,672	1,532	186	5,228	74,019

Appendix C.2. Age and sex composition of the Canadian gill net sockeye harvest in the Taku River, 1989.

			Brood Year and Age Class									
			1986		1985		1984			1983		
Stat. Week	Percent Males		0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
6/25-7/01	46.6	Sample	2	0	7	24	0	104	3	1	7	148
Week 26		Percent	1.4		4.7	16.2		70.3	2.0	0.7	4.7	
		S.E.	0.9		1.7	2.9		3.6	1.1	0.6	1.7	
		Catch	21		74	253		1,097	32	11	74	1,562
7/02-7/08	49.7	Sample	1	0	4	13	1	111	1	0	12	143
Week 27		Percent	0.7		2.8	9.1	0.7	77.6	0.7		8.4	
		S.E.	0.7		1.4	2.4	0.7	3.4	0.7		2.3	
		Catch	26		103	335	26	2,861	26		309	3,687
7/09-7/15	59.7	Sample	0	0	12	9	0	96	1	0	1	119
Week 28		Percent			10.1	7.6		80.7	0.8		0.8	
		S.E.			2.7	2.4		3.5	0.8		0.8	
		Catch			210	158		1,684	18		18	2,088
7/16-7/22	48.2	Sample	2	0	11	19	0	101	2	1	5	141
Week 29		Percent	1.4		7.8	13.5		71.6	1.4	0.7	3.5	
		S.E.	1.0		2.2	2.8		3.7	1.0	0.7	1.5	
		Catch	32		178	307		1,630	32	16	80	2,275
7/23-7/29	44.4	Sample	8	0	41	30	0	92	5	0	11	187
Week 30		Percent	4.3		21.9	16.0		49.2	2.7		5.9	
		S.E.	1.4		2.9	2.6		3.6	1.1		1.7	
		Catch	140		717	525		1,610	87		192	3,271
7/30-8/05	54.1	Sample	4	1	28	16	1	83	1	0	2	136
Week 31		Percent	2.9	0.7	20.6	11.8	0.7	61.0	0.7		1.5	
		S.E.	1.4	0.7	3.4	2.7	0.7	4.1	0.7		1.0	
		Catch	68	17	470	268	17	1,390	17		34	2,281
8/06-8/12	49.5	Sample	4	0	31	13	0	126	3	1	4	182
Week 32		Percent	2.2		17.0	7.1		69.2	1.6	0.5	2.2	
		S.E.	1.1		2.7	1.8		3.3	0.9	0.5	1.1	
		Catch	60		469	196		1,905	45	15	60	2,750
8/13-8/25	33.6	Sample	3	0	24	24	0	92	4	0	0	147
Wk. 33-34		Percent	2.0		16.3	16.3		62.6	2.7			
		S.E.	1.0		2.7	2.7		3.5	1.2			
		Catch	13		103	103		395	17			631
	49.4	Sample	24	1	158	148	2	805	20	3	42	1,203
Season		Percent	1.9	0.1	12.5	11.6	0.2	67.8	1.5	0.2	4.1	
Totals		S.E.	0.4	0.1	0.9	0.9	0.2	1.3	0.3	0.1	0.6	
		Catch	360	17	2,324	2,145	43	12,572	274	42	768	18,545

Appendix C.3. Age and sex composition of sockeye salmon caught in the Canyon Island fish wheels, 1989.

			Brood Year and Age Class										
			1987	1986		1985			1984		1983		
Stat. Week	Percent Males		0.1	0.2	1.1	0.3	1.2	2.1	1.3	2.2	1.4	2.3	Total
5/28-6/10 Wks 22-23	56.2	Sample	0	0	0	1	4	0	120	0	0	5	130
		Percent				0.8	3.1		92.3			3.8	
		S.E.				0.8	1.5		2.3			1.7	
6/11-6/17 Week 24	57.4	Sample	0	0	0	10	17	0	404	1	0	16	448
		Percent				2.2	3.8		90.2	0.2		3.6	
		S.E.				0.7	0.9		1.4	0.2		0.9	
6/18-6/24 Week 25	59.0	Sample	0	3	0	6	42	0	203	9	0	20	283
		Percent		1.1		2.1	14.8		71.7	3.2		7.1	
		S.E.		0.6		0.9	2.1		2.7	1.0		1.5	
6/25-7/01 Week 26	56.8	Sample	0	6	5	7	108	1	254	8	2	20	411
		Percent		1.5	1.2	1.7	26.3	0.2	61.8	1.9	0.5	4.9	
		S.E.		0.6	0.5	0.6	2.2	0.2	2.4	0.7	0.3	1.1	
7/02-7/08 Week 27	57.2	Sample	0	6	16	22	92	0	275	7	2	29	449
		Percent		1.3	3.6	4.9	20.5		61.2	1.6	0.4	6.5	
		S.E.		0.5	0.9	1.0	1.9		2.2	0.6	0.3	1.1	
7/09-7/15 Week 28	54.8	Sample	0	10	26	49	104	1	357	27	2	30	606
		Percent		1.7	4.3	8.1	17.2	0.2	58.9	4.5	0.3	5.0	
		S.E.		0.5	0.8	1.1	1.5	0.2	1.9	0.8	0.2	0.9	
7/16-7/22 Week 29	61.9	Sample	0	32	28	38	111	0	198	20	1	19	447
		Percent		7.2	6.3	8.5	24.8		44.3	4.5	0.2	4.3	
		S.E.		1.2	1.1	1.3	2.0		2.3	1.0	0.2	0.9	
7/23-7/29 Week 30	55.5	Sample	2	22	30	35	73	3	199	15	0	10	389
		Percent	0.5	5.7	7.7	9.0	18.8	0.8	51.2	3.9		2.6	
		S.E.	0.4	1.1	1.3	1.4	1.9	0.4	2.5	1.0		0.8	
7/30-8/05 Week 31	45.4	Sample	6	26	17	65	118	4	205	18	0	11	470
		Percent	1.3	5.5	3.6	13.8	25.1	0.9	43.6	3.8		2.3	
		S.E.	0.5	1.0	0.8	1.6	2.0	0.4	2.2	0.9		0.7	
8/06-8/12 Week 32	55.8	Sample	4	14	35	42	72	3	140	16	1	4	331
		Percent	1.2	4.2	10.6	12.7	21.8	0.9	42.3	4.8	0.3	1.2	
		S.E.	0.6	1.1	1.7	1.8	2.2	0.5	2.7	1.2	0.3	0.6	
8/13-8/19 Week 33	45.2	Sample	0	3	9	13	40	3	71	13	0	3	155
		Percent		1.9	5.8	8.4	25.8	1.9	45.8	8.4		1.9	
		S.E.		1.1	1.9	2.2	3.5	1.1	4.0	2.2		1.1	
8/20-10/7 Wks 34-40	45.1	Sample	0	6	14	9	49	3	62	6	1	3	153
		Percent		3.9	9.2	5.9	32	2	40.5	3.9	0.7	2	
		S.E.		1.6	2.3	1.9	3.8	1.1	4.0	1.6	0.6	1.1	
Season Totals	54.2	Sample	12	128	180	297	830	18	2,488	140	9	170	4,272
		Percent	0.2	2.8	4.3	6.5	19.5	0.6	58.7	3.4	0.2	3.8	
		S.E.	0.1	0.3	0.3	0.4	0.6	0.1	0.8	0.3	0.1	0.3	

Appendix C.4. Age and sex composition of Taku River and Port Snettisham sockeye salmon escapements, 1989. Escapement numbers are from systems which had weirs, the other systems were sampled during spawning ground surveys.

System	Percent Males		Brood Year and Age Class										
			1987	1986		1985			1984		1983		
			0.1	0.2	1.1	0.3	1.2	2.1	1.3	2.2	1.4	2.3	Total
Port Snettisham													
Crescent Lake	28.0	Sample	0	2	0	5	47	0	624	30	0	71	779
		Percent		0.3		0.6	6.2		80.1	3.8		9	
		S.E.		0.1		0.2	0.5		0.8	0.4		0.5	
		Escapement		3		7	68		890	42		99	1,109[a]
Speel Lake	43.3	Sample	0	1	0	0	323	0	703	28	1	72	1,128
		Percent		0.1			27.3		62.7	2.7	0.1	7.4	
		S.E.		0.1			1.6		1.8	0.6	0.1	1	
		Escapement		3			3,338		7,663	325	1	899	12,229
Taku River Lake Systems:													
Kuthai Lake	64.7	Sample	0	0	0	0	7	0	292	1	0	45	345
		Percent					2		84.7	0.3		13	
		S.E.					0.7		1.9	0.3		1.8	
Little Trapper Lake	61.7	Sample	0	0	0	0	66	0	460	37	1	67	631
		Percent					10.2		77.1	3.4	0.4	8.9	
		S.E.					1.8		2.5	1	0.4	1.6	
		Escapement					975		7,370	325	42	854	9,556
Little Tatsamenie Lake	55.0	Sample	0	25	0	58	165	0	169	53	1	11	482
		Percent		5.3		12.2	34.3		35.2	10.5	0.2	2.2	
		S.E.		0.9		1.4	2.0		2.0	1.2	0.2	0.6	
		Escapement		161		371	1,043		1,072	320	6	66	3,039
Mainstem, River, and Slough Spawners:													
Nahlin River	68.1	Sample	0	0	0	3	4	0	38	0	0	2	47
		Percent				6.4	8.5		80.9			4.3	
		S.E.				3.6	4.1		5.8			3	
Tuskwa Slough	60.0	Sample	0	4	1	9	3	0	3	0	0	0	20
		Percent		20	5	45	15		15				
		S.E.		9.2	5	11.4	8.2		8.2				
Yonakina Slough	65.4	Sample	2	7	1	9	12	0	47	0	0	0	78
		Percent	2.6	9	1.3	11.5	15.4		60.3				
		S.E.	1.8	3.2	1.3	3.6	4.1		5.6				
Chunk Mountain Slough	71.7	Sample	0	14	3	6	8	0	15	0	0	0	46
		Percent		30.4	6.5	13	17.4		32.6				
		S.E.		6.8	3.7	5	5.6		7				
Tulsequah Tributary	41.7	Sample	0	0	0	3	9	0	11	1	0	0	24
		Percent				12.5	37.5		45.8	4.2			
		S.E.				6.9	10.1		10.4	4.2			
South Fork Slough	61.8	Sample	0	6	0	9	18	0	21	0	0	1	55
		Percent		10.9		16.4	32.7		38.2			1.8	
		S.E.		4.2		5	6.4		6.6			1.8	
Yehring Creek	62.2	Sample	0	1	2	1	28	1	76	2	0	0	111
		Percent		0.9	1.8	0.9	25.9	0.9	67.9	1.8			
		S.E.		0.9	1.2	0.9	4.1	0.9	4.4	1.2			

[a] Escapement may have been higher due to uncounted fish passage over the weir during high water.

Appendix C.5. Estimated contributions of sockeye salmon stocks originating in Alaska and Canada to Alaska's District 111 drift gill net fishery, 1989.

Dates	Group	Catch By Age Class 1.2	1.3	2.2	2.3	0.+	Other	Total	Percent	Standard Error[a]	90% C.I.[a] Lower	Upper
6/18-6/24	Kuthai	395	2,509	36	68	0	6	3,014	49.3	254.7	2,595	3,433
Week 25	Trapper/Main	47	2,121	30	289	145	4	2,636	43.1	380.5	2,010	3,262
	L. Tatsamenie	60	0	1	52	7	0	120	2.0	55.3	29	211
	Crescent	0	98	1	0	0	0	99	1.6	150.2	0	346
	Speel	37	182	3	28	0	0	250	4.1	270.4	0	695
	Total	539	4,910	71	437	152	10	6,119				
6/25-7/01	Kuthai	432	597	8	82	0	6	1,125	15.9	201.3	794	1,456
Week 26	Trapper/Main	51	4,479	37	353	319	28	5,267	74.3	468.4	4,496	6,038
	L. Tatsamenie	66	453	4	62	38	3	626	8.8	21.0	592	660
	Crescent	0	0	0	0	0	0	0	0.0			
	Speel	41	0	1	33	0	0	75	1.1	61.8	0	177
	Total	590	5,529	50	530	357	37	7,093				
7/02-7/08	Kuthai	30	692	12	146	0	0	880	8.5	262.7	448	1,312
Week 27	Trapper/Main	305	6,555	101	626	766	0	8,353	80.5	659.2	7,269	9,437
	L. Tatsamenie	103	613	11	111	85	0	923	8.9	19.0	892	954
	Crescent	0	0	0	0	0	0	0	0.0			
	Speel	160	0	3	59	0	0	222	2.1	91.8	71	373
	Total	598	7,860	127	942	851	0	10,378				
7/09-7/15	Kuthai	62	86	2	67	0	2	219	1.3	148.9	0	464
Week 28	Trapper/Main	633	9,211	105	942	2,136	76	13,103	75.5	1554.5	10,546	15,660
	L. Tatsamenie	213	921	11	58	236	9	1,448	8.3	18.7	1,417	1,479
	Crescent	0	1,032	10	40	0	8	1,090	6.3	640.2	37	2,143
	Speel	331	1,032	14	97	0	11	1,485	8.6	959.7	0	3,064
	Total	1,239	12,282	142	1,204	2,372	106	17,345				
7/16-7/22	Kuthai	57	66	5	53	0	0	181	1.2	261.2	0	611
Week 29	Trapper/Main	587	5,881	224	739	2,513	0	9,944	66.3	1329.4	7,757	12,131
	L. Tatsamenie	198	1,489	54	45	604	0	2,390	15.9	40.3	2,324	2,456
	Crescent	0	688	22	31	0	0	741	4.9	487.7	0	1,543
	Speel	307	1,301	52	77	0	0	1,737	11.6	781.6	451	3,023
	Total	1,149	9,425	357	945	3,117	0	14,993				
7/23-7/29	Kuthai	7	95	2	7	0	1	112	1.4	79.7	0	243
Week 30	Trapper/Main	267	1,577	34	27	727	11	2,643	32.9	626.8	1,612	3,674
	L. Tatsamenie	466	1,052	31	174	658	10	2,391	29.8	147.1	2,149	2,633
	Crescent	0	450	9	36	0	3	498	6.2	147.1	256	740
	Speel	104	2,115	43	112	0	14	2,388	29.7	258.3	1,963	2,813
	Total	844	5,289	119	356	1,385	39	8,032	100.0	454.9	7,284	8,780
7/30-8/05	Kuthai	3	72	4	4	0	0	83	2.1	58.5	0	179
Week 31	Trapper/Main	115	626	40	14	240	2	1,037	26.1	411.0	361	1,713
	L. Tatsamenie	200	869	62	86	367	2	1,586	39.9	260.4	1,158	2,014
	Crescent	0	485	27	18	0	1	531	13.4	165.7	258	804
	Speel	45	599	37	56	0	2	739	18.6	224.6	370	1,108
	Total	363	2,651	170	178	607	7	3,976				
8/06-8/12	Kuthai	0	0	0	1	0	0	1	0.0	4.0	0	8
Week 32	Trapper/Main	157	1,013	64	0	206	0	1,440	57.2	234.7	1,054	1,826
	L. Tatsamenie	87	591	39	31	125	0	873	34.7	167.1	598	1,148
	Crescent	0	142	8	3	0	0	153	6.1	89.0	7	299
	Speel	4	34	3	10	0	0	51	2.0	104.7	0	223
	Total	248	1,780	114	45	331	0	2,518				
8/13-9/23	Kuthai	0	54	9	18	0	0	81	2.3	65.8	0	189
Wks 33-38	Trapper/Main	277	651	119	0	103	0	1,150	32.3	290.6	672	1,628
	L. Tatsamenie	153	387	123	410	106	0	1,179	33.1	112.7	994	1,364
	Crescent	0	566	77	34	0	0	677	19.0	143.3	441	913
	Speel	7	288	54	129	0	0	478	13.4	165.5	206	750
	Total	437	1,946	302	591	209	0	3,565				
	Kuthai	986	4,171	78	446	0	15	5,696	7.7	500.3	4,873	6,519
Season	Trapper/Main	2,439	32,114	754	2,990	7,155	121	45,573	61.6	2336.7	41,729	49,417
Totals	L. Tatsamenie	1,546	6,375	336	1,029	2,226	24	11,536	15.6	156.3	11,279	11,793
	Crescent	0	3,461	154	162	0	12	3,789	5.1	885.1	2,333	5,245
	Speel	1,036	5,551	210	601	0	27	7,425	10.0	1367.8	5,175	9,675
	Total	6,007	51,672	1,532	5,228	9,381	199	74,019				

[a] The standard errors are minimum estimates since no estimates of the variance for stocks contributing 0 fish during a given week or for fish other than age-1.2, -1.3, or -2.3 are available. The 90% confidence intervals are affected in like manner.

Appendix C.6. Estimated CPUE and migratory timing of sockeye salmon stocks in Alaska's District 111 drift gill net fishery, 1989.

CPUE

Stat Week	Days Open	Average Number Boats	Catch per Boat Day Kuthai	Tr/Main	L. Tats.	Crescent	Speel	Total
25	3	63	16	14	1	1	1	32
26	3	63	6	28	3	0	0	38
27	3	74	4	38	4	0	1	47
28	3	78	1	56	6	5	6	74
29	3	69	1	48	12	4	8	72
30	3	59	1	15	14	3	13	45
31	3	38	1	9	14	5	6	35
32	3	18	0	27	16	3	1	47
33-38	13	60	0	1	2	1	1	5
Total			29	236	71	20	39	395

Migratory Timing

Stat Week	Proportion of Catch per Boat Day Kuthai	Tr/Main	L. Tats.	Crescent	Speel	Total
25	0.547	0.059	0.009	0.026	0.034	0.082
26	0.204	0.118	0.047	0.000	0.010	0.095
27	0.136	0.160	0.059	0.000	0.026	0.118
28	0.032	0.238	0.087	0.234	0.163	0.188
29	0.030	0.204	0.163	0.180	0.215	0.184
30	0.022	0.063	0.190	0.141	0.346	0.115
31	0.025	0.039	0.196	0.234	0.166	0.088
32	0.001	0.113	0.228	0.142	0.024	0.118
33-38	0.004	0.006	0.021	0.044	0.016	0.012
Total	1.000	1.000	1.000	1.000	1.000	1.000

Appendix C.7. Estimated contributions of sockeye salmon stocks to the Taku River gill net fishery, 1989.

Dates	Group	Catch By Age Class						Total	Percent	Standard Error[a]	90% C.I.[b]	
		1.2	1.3	2.2	2.3	0.+	Other				Lower	Upper
6/25-7/01	Kuthai	127	327	11	25	0	3	493	31.6	5.5	484	502
Week 26	Trapper/Main	75	770	20	46	95	8	1,014	64.9	75.2	890	1,138
	L. Tatsamenie	51	0	1	3	0	0	55	3.5	44.8	0	129
	Total	253	1,097	32	74	95	11	1,562				
7/02-7/08	Kuthai	168	192	3	35	0	0	398	10.8	38.4	335	461
Week 27	Trapper/Main	99	2,406	20	243	140	0	2,908	78.9	267.5	2,468	3,348
	L. Tatsamenie	68	263	3	32	15	0	381	10.3	242.1	0	779
	Total	335	2,861	26	310	155	0	3,687				
7/09-7/15	Kuthai	4	12	0	0	0	0	16	0.8	34.8	0	7
Week 28	Trapper/Main	114	1,465	16	16	184	0	1,795	86.0	156.8	1,537	2,053
	L. Tatsamenie	40	207	2	2	26	0	277	13.3	147.4	34	520
	Total	158	1,684	18	18	210	0	2,088				
7/16-7/22	Kuthai	9	11	0	1	0	0	21	0.9	54.0	0	110
Week 29	Trapper/Main	220	1,523	29	72	198	15	2,057	90.4	187.9	1,748	2,366
	L. Tatsamenie	78	96	3	7	12	1	197	8.7	177.4	0	489
	Total	307	1,630	32	80	210	16	2,275				
7/23-7/29	Kuthai	18	0	1	2	0	0	21	0.6	11.7	2	40
Week 30	Trapper/Main	373	1,430	73	162	761	0	2,799	85.6	195.4	2,478	3,120
	L. Tatsamenie	134	180	13	28	96	0	451	13.8	170.9	170	732
	Total	525	1,610	87	192	857	0	3,271				
7/30-8/05	Kuthai	9	0	0	0	0	0	9	0.4	23.7	0	48
Week 31	Trapper/Main	190	686	9	18	273	9	1,185	52.0	224.7	815	1,555
	L. Tatsamenie	69	704	8	16	282	8	1,087	47.7	224.1	718	1,456
	Total	268	1,390	17	34	555	17	2,281				
8/06-8/12	Kuthai	0	30	1	1	0	0	32	1.2	22.8	0	70
Week 32	Trapper/Main	52	1,180	26	35	333	9	1,635	59.5	192.1	1,319	1,951
	L. Tatsamenie	144	695	18	24	196	6	1,083	39.4	188.6	773	1,393
	Total	196	1,905	45	60	529	15	2,750				
8/13-8/25	Kuthai	0	0	0	0	0	0	0	0.0			
Wks 33-34	Trapper/Main	28	279	10	0	82	0	399	63.2	71.5	281	517
	L. Tatsamenie	75	116	7	0	34	0	232	36.8	70.8	116	348
	Total	103	395	17	0	116	0	631				
	Kuthai	335	572	16	64	0	3	990	5.3	74.3	868	1,112
Season	Trapper/Main	1,151	9,739	203	592	2,066	41	13,792	74.4	500.0	12,970	14,614
Totals	L. Tatsamenie	659	2,261	55	112	661	15	3,763	20.3	464.7	2,999	4,527
	Total	2,145	12,572	274	768	2,727	59	18,545				

[a] The standard errors are minimum estimates since no estimates of the variance for stocks contributing 0 fish during a given week or for the fish other than age-1.2 and -1.3 are available. The 90% confidence intervals are affected in like manner.

Appendix C.8. Estimated CPUE and migratory timing of sockeye salmon stocks caught in the Taku River commercial fishery, 1989.

CPUE

Stat Week	Days Open	Average Number Permits	Catch per Permit Day			
			Kuthai	Tr/Main L.	Tats.	Total
26	2.0	11.5	21	44	2	68
27	4.0	11.3	9	64	8	82
28	4.0	8.8	0	51	8	59
29	3.0	12.0	1	57	5	63
30	4.0	10.8	0	65	10	76
31	3.0	11.0	0	36	33	69
32	3.0	10.0	1	55	36	92
33-34	2.3	10.0	0	17	10	27
Total			33	389	114	536

Migratory Timing

Stat Week	Proportion of Catch per Boat Day			
	Kuthai	Tr/Main L.	Tats.	Total
26	0.65	0.11	0.02	0.13
27	0.27	0.17	0.07	0.15
28	0.01	0.13	0.07	0.11
29	0.02	0.15	0.05	0.12
30	0.01	0.17	0.09	0.14
31	0.01	0.09	0.29	0.13
32	0.03	0.14	0.32	0.17
33-34	0.00	0.04	0.09	0.05
Total	1.00	1.00	1.00	1.00

Appendix C.9. Estimated stock specific sockeye salmon catch in the Canyon Island fish wheel, 1989.

		Catch By Age Class									90% C.I.[a]	
Dates	Group	1.2	1.3	2.2	2.3	0.+	Other	Total	Percent	Standard Error[a]	Lower	Upper
5/28-6/10	Kuthai	2	97	0	4	0	0	103	79.2	5.3	94	112
Wks 22-23	Trapper/Main	1	12	0	1	1	0	15	11.5	5.6	6	24
	L. Tatsamenie	1	11	0	0	0	0	12	9.2	5.8	2	22
	Total	4	120	0	5	1	0	130				
6/11-6/17	Kuthai	9	321	1	12	0	0	343	76.6	17.3	315	371
Week 24	Trapper/Main	5	46	0	2	6	0	59	13.2	19.6	27	91
	L. Tatsamenie	3	37	0	2	4	0	46	10.3	19.6	14	78
	Total	17	404	1	16	10	0	448				
6/18-6/24	Kuthai	22	131	6	13	0	0	172	60.8	11.3	153	191
Week 25	Trapper/Main	12	53	2	5	6	0	78	27.6	15.3	53	103
	L. Tatsamenie	8	19	1	2	3	0	33	11.7	14.0	10	56
	Total	42	203	9	20	9	0	283				
6/25-7/01	Kuthai	34	27	1	3	0	1	66	16.1	9.9	50	82
Week 26	Trapper/Main	74	227	7	17	13	7	345	83.9	11.2	327	363
	L. Tatsamenie	0	0	0	0	0	0	0	0.0		0	
	Total	108	254	8	20	13	8	411				
7/02-7/08	Kuthai	13	7	0	2	0	1	23	5.1	6.2	13	33
Week 27	Trapper/Main	79	266	7	27	28	17	424	94.4	22.0	388	460
	L. Tatsamenie	0	2	0	0	0	0	2	0.4	19.7	0	34
	Total	92	275	7	29	28	18	449				
7/09-7/15	Kuthai	4	10	1	1	0	1	17	2.8	11.3	0	36
Week 28	Trapper/Main	100	297	23	26	52	25	523	86.3	30.9	472	574
	L. Tatsamenie	0	50	3	3	7	3	66	10.9	22.0	30	102
	Total	104	357	27	30	59	29	606				
7/16-7/22	Kuthai	1	0	0	0	0	0	1	0.2	2.2	0	5
Week 29	Trapper/Main	110	198	20	19	70	29	446	99.8	10.0	430	462
	L. Tatsamenie	0	0	0	0	0	0	0	0.0		0	
	Total	111	198	20	19	70	29	447				
7/23-7/29	Kuthai	1	0	0	0	0	0	1	0.3	2.3	0	5
Week 30	Trapper/Main	72	157	13	8	50	28	328	84.3	17.6	299	357
	L. Tatsamenie	0	42	2	2	9	5	60	15.4	15.9	34	86
	Total	73	199	15	10	59	33	389	100.0			
7/30-8/05	Kuthai	0	0	0	0	0	0	0	0.0		0	
Week 31	Trapper/Main	87	172	14	9	78	17	377	80.2	23.7	338	416
	L. Tatsamenie	31	33	4	2	19	4	93	19.8	22.3	56	130
	Total	118	205	18	11	97	21	470				
8/06-8/12	Kuthai	0	0	0	0	0	0	0	0.0	1.0	0	2
Week 32	Trapper/Main	53	111	12	3	46	30	255	77.0	16.4	228	282
	L. Tatsamenie	19	29	4	1	14	9	76	23.0	15.1	51	101
	Total	72	140	16	4	60	39	331				
8/13-8/19	Kuthai	0	0	0	0	0	0	0	0.0	1.0	0	2
Week 33	Trapper/Main	36	65	12	3	15	11	142	91.6	9.7	126	158
	L. Tatsamenie	4	6	1	0	1	1	13	8.4	8.3	0	27
	Total	40	71	13	3	16	12	155				
8/20-10/7	Kuthai	0	0	0	0	0	0	0	0.0	1.0	0	2
Wks 34-40	Trapper/Main	44	49	5	2	12	15	127	83.0	14.8	103	151
	L. Tatsamenie	5	13	1	1	3	3	26	17.0	14.1	3	49
	Total	49	62	6	3	15	18	153				
	Kuthai	86	593	9	35	0	3	726	17.0	26.5	682	770
Season	Trapper/Main	673	1,653	115	122	377	179	3119	73.0	61.1	3,019	3,219
Totals	L. Tatsamenie	71	242	16	13	60	25	427	10.0	51.9	342	512
	Total	830	2,488	140	170	437	207	4272				

[a] The standard errors are minimum estimates since no estimates of the variance for stocks contributing 0 fish during a given week or for fish other than age-1.2 and -1.3 are available. The 90% confidence intervals are affected in like manner.

Appendix C.10. Estimated age-specific stock proportions of sockeye salmon in Canyon Island fish wheel catches, 1989.

Dates	Group	Catch By Age Class 1.2	1.3	2.2	2.3	0.+	Other
5/28-6/10	Kuthai	0.519	0.804	0.795	0.795	0.000	0.795
Wks 22-23	Trapper/Main	0.281	0.102	0.108	0.108	0.525	0.108
	L. Tatsamenie	0.200	0.094	0.097	0.097	0.475	0.097
6/11-6/17	Kuthai	0.519	0.794	0.783	0.783	0.000	0.783
Week 24	Trapper/Main	0.281	0.114	0.121	0.121	0.556	0.121
	L. Tatsamenie	0.200	0.092	0.096	0.096	0.444	0.096
6/18-6/24	Kuthai	0.519	0.643	0.622	0.622	0.000	0.622
Week 25	Trapper/Main	0.281	0.263	0.266	0.266	0.703	0.266
	L. Tatsamenie	0.200	0.094	0.112	0.112	0.297	0.112
6/25-7/01	Kuthai	0.312	0.105	0.167	0.167	0.000	0.167
Week 26	Trapper/Main	0.688	0.895	0.833	0.833	1.000	0.833
	L. Tatsamenie	0.000	0.000	0.000	0.000	0.000	0.000
7/02-7/08	Kuthai	0.138	0.027	0.055	0.055	0.000	0.055
Week 27	Trapper/Main	0.862	0.967	0.941	0.941	0.995	0.941
	L. Tatsamenie	0.000	0.006	0.004	0.004	0.005	0.004
7/09-7/15	Kuthai	0.037	0.027	0.029	0.029	0.000	0.029
Week 28	Trapper/Main	0.963	0.834	0.863	0.863	0.889	0.863
	L. Tatsamenie	0.000	0.139	0.108	0.108	0.111	0.108
7/16-7/22	Kuthai	0.006	0.000	0.002	0.002	0.000	0.002
Week 29	Trapper/Main	0.994	1.000	0.998	0.998	1.000	0.998
	L. Tatsamenie	0.000	0.000	0.000	0.000	0.000	0.000
7/23-7/29	Kuthai	0.012	0.000	0.003	0.003	0.000	0.003
Week 30	Trapper/Main	0.988	0.790	0.843	0.843	0.846	0.843
	L. Tatsamenie	0.000	0.210	0.154	0.154	0.154	0.154
7/30-8/05	Kuthai	0.000	0.000	0.000	0.000	0.000	0.000
Week 31	Trapper/Main	0.738	0.841	0.803	0.803	0.803	0.803
	L. Tatsamenie	0.262	0.159	0.197	0.197	0.197	0.197
8/06-8/12	Kuthai	0.000	0.000	0.000	0.000	0.000	0.000
Week 32	Trapper/Main	0.743	0.790	0.774	0.774	0.774	0.774
	L. Tatsamenie	0.257	0.210	0.226	0.226	0.226	0.226
8/13-8/19	Kuthai	0.000	0.000	0.000	0.000	0.000	0.000
Week 33	Trapper/Main	0.892	0.922	0.911	0.911	0.911	0.911
	L. Tatsamenie	0.108	0.078	0.089	0.089	0.089	0.089
8/20-10/7	Kuthai	0.000	0.000	0.000	0.000	0.000	0.000
Wks 34-40	Trapper/Main	0.892	0.785	0.832	0.832	0.832	0.832
	L. Tatsamenie	0.108	0.215	0.168	0.168	0.168	0.168
	Kuthai	0.104	0.238	0.064	0.206	0.000	0.014
Season	Trapper/Main	0.811	0.664	0.821	0.718	0.863	0.865
Totals	L. Tatsamenie	0.086	0.097	0.114	0.076	0.137	0.121

Appendix D.1. Stock compositions of sockeye salmon harvested in Alaska's District 111 drift gill net fishery, 1986-1989.

		Year and Date of Stat. Week 25 (June)				
Stat. Week	Group	1986 6/15-21	1987 6/14-20	1988 6/19-25	1989 6/18-24	a/ Average
25	Kuthai	0.783			0.493	0.520
	L. Trapper	0.048			0.431	0.009
	Mainstem	0.057				0.011
	L. Tatsamenie	0.050			0.020	0.022
	Crescent	0.033			0.016	0.018
	Speel	0.029			0.041	0.040
	Percent Taku	0.938			0.943	0.563
26	Kuthai	0.689	0.615	0.658	0.159	0.402
	L. Trapper	0.123	0.000	0.193	0.743	0.069
	Mainstem	0.125	0.352	0.000		0.106
	L. Tatsamenie	0.015	0.014	0.113	0.088	0.071
	Crescent	0.006	0.018	0.019	0.000	0.008
	Speel	0.041	0.000	0.017	0.011	0.013
	Percent Taku	0.952	0.982	0.964	0.989	0.648
27	Kuthai	0.341	0.311	0.408	0.085	0.243
	L. Trapper	0.319	0.216	0.390	0.805	0.239
	Mainstem	0.208	0.336	0.000		0.154
	L. Tatsamenie	0.005	0.037	0.089	0.089	0.062
	Crescent	0.096	0.013	0.081	0.000	0.035
	Speel	0.031	0.086	0.033	0.021	0.041
	Percent Taku	0.874	0.901	0.886	0.979	0.699
28	Kuthai	0.068	0.097	0.136	0.013	0.053
	L. Trapper	0.666	0.347	0.597	0.755	0.382
	Mainstem	0.103	0.385	0.000		0.113
	L. Tatsamenie	0.042	0.054	0.156	0.083	0.077
	Crescent	0.107	0.072	0.080	0.063	0.077
	Speel	0.013	0.045	0.031	0.086	0.055
	Percent Taku	0.880	0.884	0.889	0.852	0.625
29	Kuthai	0.048	0.067	0.024	0.012	0.039
	L. Trapper	0.384	0.590	0.143	0.663	0.393
	Mainstem	0.303	0.235	0.252		0.244
	L. Tatsamenie	0.116	0.056	0.090	0.159	0.109
	Crescent	0.126	0.016	0.447	0.049	0.110
	Speel	0.022	0.036	0.043	0.116	0.058
	Percent Taku	0.852	0.948	0.510	0.835	0.785
30	Kuthai	0.003	0.044	0.012	0.014	0.021
	L. Trapper	0.249	0.178	0.020	0.329	0.173
	Mainstem	0.292	0.182	0.568		0.344
	L. Tatsamenie	0.234	0.010	0.043	0.298	0.126
	Crescent	0.112	0.304	0.188	0.062	0.187
	Speel	0.111	0.281	0.169	0.297	0.218
	Percent Taku	0.778	0.414	0.643	0.641	0.665
31	Kuthai	0.000	0.000	0.000	0.021	0.002
	L. Trapper	0.171	0.084	0.000	0.261	0.137
	Mainstem	0.392	0.498	0.562		0.546
	L. Tatsamenie	0.288	0.037	0.115	0.399	0.188
	Crescent	0.047	0.301	0.273	0.134	0.174
	Speel	0.102	0.080	0.050	0.186	0.097
	Percent Taku	0.851	0.619	0.677	0.681	0.872
32	Kuthai	0.013	0.022	0.005	0.000	0.014
	L. Trapper	0.082	0.158	0.000	0.572	0.128
	Mainstem	0.262	0.509	0.404		0.487
	L. Tatsamenie	0.399	0.000	0.118	0.347	0.166
	Crescent	0.143	0.139	0.452	0.061	0.174
	Speel	0.100	0.172	0.020	0.020	0.113
	Percent Taku	0.757	0.689	0.528	0.919	0.796
33	Kuthai	0.001	0.000	0.013	0.023	0.007
	L. Trapper	0.003	0.152	0.032	0.323	0.064
	Mainstem	0.474	0.643	0.389		0.528
	L. Tatsamenie	0.416	0.046	0.044	0.331	0.239
	Crescent	0.000	0.159	0.466	0.190	0.156
	Speel	0.107	0.000	0.056	0.134	0.076
	Percent Taku	0.893	0.841	0.478	0.676	0.839
34-40	Kuthai	0.001	0.000	0.000	b/	0.000
	L. Trapper	0.111	0.000	0.094		0.076
	Mainstem	0.404	0.693	0.252		0.453
	L. Tatsamenie	0.223	0.037	0.000		0.124
	Crescent	0.115	0.035	0.585		0.193
	Speel	0.146	0.234	0.069		0.154
	Percent Taku	0.739	0.731	0.346		0.653
	Kuthai	0.062	0.078	0.120	0.077	0.079
	L. Trapper	0.267	0.235	0.159	0.616	0.221
	Mainstem	0.302	0.375	0.305		0.317
	L. Tatsamenie	0.204	0.031	0.083	0.156	0.123
	Crescent	0.090	0.157	0.262	0.051	0.124
	Speel	0.075	0.123	0.071	0.100	0.095
	Total Taku	0.834	0.720	0.667	0.849	0.780

a/ Stock specific averages do not include Mainstem and Trapper in 1989 since these stock groups were combined in that year.
b/ The last figures in each column include catch from that week through the end of the season.

Appendix D.2. Stock specific weekly catches of sockeye salmon in Alaska's District 111 drift gill net fisheries, 1986-1989.

		Year and Date of Stat. Week 25 (June)				
Stat. Week	Group	1986 6/15-21	1987 6/14-20	1988 6/19-25	1989 6/18-24	a/ Average
25	Kuthai	506			3,014	1,760
	L. Trapper	31			2,636	31
	Mainstem	37				37
	L. Tatsamenie	32			120	76
	Crescent	21			99	60
	Speel	19			250	135
	Total	646			6,119	3,383
26	Kuthai	1,113	1,607	1,808	1,125	1,413
	L. Trapper	199	0	530	5,267	243
	Mainstem	202	920	0		374
	L. Tatsamenie	25	36	311	626	250
	Crescent	10	48	53	0	28
	Speel	67	0	47	75	47
	Total	1,616	2,611	2,749	7,093	3,517
27	Kuthai	1,486	1,934	1,982	880	1,571
	L. Trapper	1,390	1,344	1,895	8,353	1,543
	Mainstem	904	2,085	0		996
	L. Tatsamenie	23	231	431	923	402
	Crescent	416	80	395	0	223
	Speel	134	535	158	222	262
	Total	4,353	6,209	4,861	10,378	6,450
28	Kuthai	614	531	535	219	475
	L. Trapper	5,994	1,906	2,354	13,103	3,418
	Mainstem	931	2,114	0		1,015
	L. Tatsamenie	381	297	615	1,448	685
	Crescent	960	395	315	1,090	690
	Speel	120	244	124	1,485	493
	Total	9,000	5,487	3,943	17,345	8,944
29	Kuthai	641	935	147	181	476
	L. Trapper	5,138	8,260	862	9,944	4,753
	Mainstem	4,051	3,289	1,516		2,952
	L. Tatsamenie	1,551	781	541	2,390	1,316
	Crescent	1,690	220	2,691	741	1,336
	Speel	294	507	257	1,737	699
	Total	13,365	13,992	6,014	14,993	12,091
30	Kuthai	31	674	111	112	232
	L. Trapper	2,744	2,756	186	2,643	1,895
	Mainstem	3,222	2,813	5,287		3,774
	L. Tatsamenie	2,582	160	398	2,391	1,383
	Crescent	1,230	4,703	1,751	498	2,046
	Speel	1,222	4,351	1,573	2,388	2,384
	Total	11,031	15,457	9,306	8,032	10,957
31	Kuthai	2	0	0	83	21
	L. Trapper	2,747	1,189	0	1,037	1,312
	Mainstem	6,301	7,024	2,393		5,239
	L. Tatsamenie	4,622	519	488	1,586	1,804
	Crescent	753	4,253	1,161	531	1,675
	Speel	1,634	1,130	214	739	929
	Total	16,059	14,115	4,256	3,976	9,602
32	Kuthai	69	205	15	1	73
	L. Trapper	439	1,508	0	1,440	649
	Mainstem	1,409	4,844	1,135		2,463
	L. Tatsamenie	2,144	0	331	873	837
	Crescent	769	1,327	1,268	153	879
	Speel	538	1,637	57	51	571
	Total	5,368	9,521	2,806	2,518	5,053
33	Kuthai	3	0	27	80	27
	L. Trapper	15	628	66	1,135	236
	Mainstem	2,358	2,662	812		1,944
	L. Tatsamenie	2,067	192	91	1,163	878
	Crescent	0	660	972	668	575
	Speel	530	0	117	472	280
	Total	4,973	4,142	2,085	3,517	3,679
34-40	Kuthai	8	0	0	b/	2
	L. Trapper	693	0	247		313
	Mainstem	2,533	2,398	660		1,863
	L. Tatsamenie	1,396	130	0		509
	Crescent	723	121	1,534		793
	Speel	913	811	181		635
	Total	6,266	3,460	2,622		4,116
	Kuthai	4,472	5,885	4,625	5,695	5,169
	L. Trapper	19,391	17,591	6,140	45,558	14,374
	Mainstem	21,948	28,149	11,803		20,633
	L. Tatsamenie	14,823	2,346	3,206	11,520	7,974
	Crescent	6,572	11,807	10,140	3,780	8,075
	Speel	5,471	9,216	2,729	7,419	6,209
	Total	72,677	74,994	38,642	73,971	65,071
	Total Taku	60,634	53,971	25,773	62,773	50,788
	Total Snett.	12,043	21,023	12,869	11,198	14,283

a/ Stock specific averages do not include Mainstem and Trapper in 1989 since these stock groups were combined in that year.

b/ The last figures in each column include catch from that week through the end of the season.

Appendix E.1. Differences between in-season and postseason stock composition estimates for Alaska's District 111 sockeye catches, 1989.

Stat. Week	Group	In-Season	Post Season	Change
6/18-6/24	Kuthai	0.526	0.493	-0.033
Week 25	Trapper/Mainstem	0.450	0.431	-0.019
	L. Tatsamenie	0.021	0.020	-0.001
	Crescent	0.000	0.016	0.016
	Speel	0.004	0.041	0.037
6/25-7/01	Kuthai	0.132	0.159	0.027
Week 26	Trapper/Mainstem	0.794	0.743	-0.051
	L. Tatsamenie	0.071	0.088	0.017
	Crescent	0.004	0.000	-0.004
	Speel	0.000	0.011	0.011
7/02-7/08	Kuthai	0.105	0.085	-0.020
Week 27	Trapper/Mainstem	0.851	0.805	-0.046
	L. Tatsamenie	0.008	0.089	0.081
	Crescent	0.022	0.000	-0.022
	Speel	0.015	0.021	0.006
7/09-7/15	Kuthai	0.001	0.013	0.012
Week 28	Trapper/Mainstem	0.944	0.755	-0.189
	L. Tatsamenie	0.045	0.083	0.038
	Crescent	0.009	0.063	0.054
	Speel	0.000	0.086	0.086
7/16-7/22	Kuthai	0.007	0.012	0.005
Week 29	Trapper/Mainstem	0.905	0.663	-0.242
	L. Tatsamenie	0.056	0.159	0.103
	Crescent	0.000	0.049	0.049
	Speel	0.032	0.116	0.084
7/23-7/29	Kuthai	0.011	0.014	0.003
Week 30	Trapper/Mainstem	0.938	0.329	-0.609
	L. Tatsamenie	0.051	0.298	0.247
	Crescent	0.000	0.062	0.062
	Speel	0.000	0.297	0.297
7/30-8/05	Kuthai	0.016	0.021	0.005
Week 31	Trapper/Mainstem	0.805	0.261	-0.544
	L. Tatsamenie	0.110	0.399	0.289
	Crescent	0.068	0.134	0.066
	Speel	0.001	0.186	0.185
8/06-8/12	Kuthai	0.000	0.000	0.000
Week 32	Trapper/Mainstem	0.843	0.572	-0.271
	L. Tatsamenie	0.086	0.347	0.261
	Crescent	0.072	0.061	-0.011
	Speel	0.000	0.020	0.020
8/13-8/19	Kuthai	0.012	0.023	0.011
Week 33	Trapper/Mainstem	0.681	0.323	-0.358
	L. Tatsamenie	0.070	0.331	0.261
	Crescent	0.237	0.190	-0.047
	Speel	0.000	0.134	0.134
	Kuthai	0.076	0.077	0.001
Fishery	Trapper/Mainstem	0.843	0.616	-0.227
Totals	L. Tatsamenie	0.049	0.156	0.107
	Crescent	0.023	0.051	0.028
	Speel	0.009	0.100	0.091